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**Environmental Justice in the Era of
Green Extractivism**

How Governance of Lithium shapes Environmental Justice in
Chile's Salar de Atacama

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AI Declaration

Generative AI (ChatGPT) was used as a supplementary research and writing support tool during the preparation of this dissertation. AI assisted with improving grammar, clarity and structure, summarising sources, refining section transitions, and providing feedback on the presentation of arguments. All substantive research decisions, including the research question, methodology, conceptual framework, analysis, interpretation of evidence and conclusions, were developed independently by the author. All information, citations and references generated with AI assistance were independently verified against the original sources, and full responsibility for the content of this dissertation rests with the author.

ABSTRACT

The global transition to low-carbon energy systems has driven unprecedented demand for critical minerals, positioning lithium as essential to decarbonisation while intensifying concerns over the environmental and social impacts of extraction. This dissertation examines how environmental justice is shaped by the governance of lithium extraction through a case study of Chile's Salar de Atacama.

Using a qualitative case study methodology, the research analyses the evolution of Chile's lithium governance and evaluates the role of domestic and international legal frameworks through the environmental justice dimensions of distributional, procedural and recognitional justice. The analysis draws upon legal and policy documents, academic literature, government publications, corporate reports and secondary empirical evidence.

The findings demonstrate that Chile has strengthened governance through increased state involvement, enhanced environmental regulation and greater recognition of Indigenous participation. These reforms have improved aspects of environmental justice but have not eliminated persistent inequalities. Environmental burdens remain concentrated among Indigenous communities, participation largely operates through consultation rather than shared decision-making, and Indigenous knowledge systems continue to receive only partial recognition within governance processes.

The dissertation argues that these limitations arise not only from weaknesses in legal implementation but also from the broader political economy of the green transition, in which governance primarily manages the impacts of extraction rather than determining whether extraction is compatible with environmental justice. It concludes that while governance reforms can improve environmental justice outcomes, they remain structurally constrained in their ability to reconcile an expanding extractive economy with the principles of environmental justice.

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Chapter 1 - Introduction

The accelerating climate crisis has placed the transition to a low-carbon economy at the centre of international environmental policy. Governments, international organisations and industry increasingly present the rapid deployment of renewable energy technologies, battery storage and electrification as essential to limiting global warming and achieving net-zero emissions. Yet this transition is fundamentally material. Rather than eliminating extraction, decarbonisation requires an unprecedented expansion in the mining of critical minerals such as lithium, copper, cobalt and nickel, which form the basis of many low-carbon technologies.¹ As a result, the green transition increasingly depends upon the expansion of extractive industries, creating a fundamental tension between global climate objectives and the environmental and social consequences of mineral extraction.

Whilst the environmental benefits of reducing greenhouse gas emissions are global, the costs of producing the minerals required to achieve this transition are experienced unevenly. Mining projects are disproportionately concentrated within resource-rich regions of the Global South, where extraction frequently places pressure on water resources, biodiversity, Indigenous territories and local livelihoods. Consequently, a growing body of scholarship argues that the green transition is not simply an environmental project but also a political and distributive one, raising important questions concerning who benefits from decarbonisation, who bears its costs, and how these outcomes are governed. Rather than replacing historical patterns of extraction, the transition risks reproducing existing inequalities through new forms of green extractivism.²

Chile provides an especially significant case through which to examine these tensions. As one of the world's largest producers of lithium and home to the Salar de Atacama, one of the planet's most productive lithium brine deposits, Chile occupies a strategically important position within global critical mineral supply chains. At the same time, the Salar de Atacama is an environmentally fragile ecosystem and the ancestral territory of Indigenous Atacameño (Lickanantay) communities whose livelihoods, cultural identity and relationships with water are closely connected to the landscape. These overlapping ecological, economic and political pressures make the region a particularly valuable case study for examining how competing objectives of decarbonisation, economic development and environmental justice are negotiated in practice.³

¹ International Energy Agency, *The Role of Critical Minerals in Clean Energy Transitions* (International Energy Agency 2021); Paris Agreement (adopted 12 December 2015, entered into force 4 November 2016) TIAS No 16-1104.

² Daniel Macmillen Voskoboynik and Diego Andreucci, 'Greening Extractivism: Environmental Discourses and Resource Governance in the "Lithium Triangle"' (2022) 5(2) *Environment and Planning E: Nature and Space* 787

³ International Energy Agency, *Critical Minerals Market Review 2023* (International Energy Agency 2023).

Debates surrounding critical mineral extraction have expanded considerably over the past decade. The existing scholarship has examined the political economy of the green transition, critiques of green extractivism, competing models of mineral governance, and the environmental injustices associated with large-scale mining. However, these bodies of literature have largely developed in parallel. Research on the green transition has primarily focused on the technical challenge of decarbonisation and supply security; governance scholarship has concentrated on questions of resource ownership, value capture and national development; whilst environmental justice scholarship has examined the unequal distribution of environmental harms and the recognition and participation of affected communities. Comparatively little research brings these perspectives together to examine how governance strategies shape environmental justice outcomes within the context of critical mineral extraction.⁴

This dissertation addresses that gap by integrating insights from political ecology, environmental justice and legal governance into a single analytical framework. Rather than asking whether mining should occur, it examines how different governance arrangements influence environmental justice outcomes and the extent to which existing institutions are capable of responding to the social and environmental challenges created by the green transition. In doing so, the dissertation treats law as one component of governance rather than as an isolated object of legal analysis, recognising that legal frameworks operate alongside political institutions, economic incentives, state strategies and corporate actors.

The dissertation is guided by the following research question:

How is environmental justice shaped by the governance of critical mineral extraction in the case of lithium mining in Chile's Salar de Atacama?

This question is explored through five sub-questions:

1. How has the governance of lithium extraction evolved in Chile's Salar de Atacama?
2. How do existing governance frameworks shape distributive, procedural and recognitional justice for Indigenous communities in the Salar de Atacama?
3. What role do domestic and international legal frameworks play in shaping these environmental justice outcomes?
4. What is limiting environmental justice from being fully delivered under the current governance model, and how could these limitations be addressed?
5. What does the Salar de Atacama case reveal about the possibilities and structural limitations of governance for reconciling green extractivism with environmental justice?

⁴ Gavin Bridge and Ludger Gailing, 'New Energy Spaces: Towards a Geographical Political Economy of Energy Transition' (2020) 52 *Environment and Planning A: Economy and Space* 1037; Gudynas (n38); Schlosberg (n90)

This dissertation argues that while Chile's governance and legal frameworks have improved aspects of distributive, procedural and recognitional justice in the governance of lithium extraction, they remain structurally constrained in their ability to reconcile environmental justice with an expanding extractive economy. These constraints arise not solely from shortcomings in legal design, but from the broader political economy of the green transition, in which lithium is simultaneously framed as a strategic resource for national development and global decarbonisation.

Chile's evolving governance model has produced important improvements in environmental regulation, public oversight and the recognition of environmental justice concerns. Nevertheless, these advances remain constrained by a broader political economy in which lithium extraction is treated simultaneously as a strategic resource for national development and an essential component of global decarbonisation. Consequently, whilst governance reforms can improve distributive, procedural and recognitional justice, they remain structurally limited in their ability to reconcile expanding extractive activity with the principles of environmental justice.

To examine these issues, the dissertation first reviews the evolution of the green transition, green extractivism, competing models of critical mineral governance and contemporary environmental justice theory before identifying the principal gaps within the existing literature. It then outlines the methodological approach before introducing the Salar de Atacama as the empirical case study. The subsequent analytical chapters evaluate Chile's governance arrangements through the lens of distributive, procedural and recognitional justice, before assessing the contribution and limitations of international and domestic legal frameworks. Finally, the dissertation considers the structural constraints identified throughout the analysis and proposes recommendations aimed at strengthening environmental justice within the governance of critical mineral extraction.

Ultimately, this dissertation argues that achieving a just green transition requires more than securing the minerals necessary for decarbonisation. It also requires governance arrangements capable of ensuring that the environmental, social and economic costs of extraction are distributed fairly, that affected communities participate meaningfully in decision-making, and that their rights, identities and relationships with the environment are recognised. The Chilean experience demonstrates both the possibilities and the limits of governance in pursuing these objectives, offering broader insights into the challenges of achieving environmental justice within an increasingly mineral-intensive global transition.

Chapter 2 - Literature Review - The Political Economy of Green Extractivism and Environmental Justice

2.1 Sustainable Development and Green Growth

Before we examine the particular effects of extracting critical minerals in Chile, I believe it is helpful to establish the foundational ideology that the green transition strategy and narratives are based upon. Since the 1950s, climate scientists were reaching the consensus that human activity, specifically with relation to the release of greenhouse gases, was going to warm the environment.⁵ In the 1970s, this became a significant policy agenda on the international stage with the United Nations Conference on the Human Environment in 1972 and the First World Climate Conference in 1979.⁶ In 1985, the Villach Conference in Austria brought together leading climate scientists, who concluded that greenhouse gases were likely to cause substantial warming in the first half of the 21st century and recommended international cooperation in structuring economic activity in order to reduce greenhouse gas emissions.⁷

Sustainable development was presented as a way of reconciling economic development with environmental protection and one of the most influential early articulations of this was the Brundtland Report, *Our Common Future* (1987),⁸ which helped consolidate the concept within international policy discourse. The report framed environmental degradation as a shared global concern, arguing that current patterns of economic activity risk causing irreversible damage to ecological systems, and that we must adjust our economic behaviour to maintain the “stock of ecological capital,” these being natural life supporting systems such as (the atmosphere, waters and soils) and reducing vulnerability to economic shocks⁹. However it was clear that this should all be achieved without abandoning economic growth and development.

The Brundtland report, along with First Assessment Report from the Intergovernmental Panel on Climate in 1990¹⁰ informed the 1992 Earth Summit, which saw the UN Framework Convention on Climate Change open for ratification, which embedded climate policy within the broader

⁵ Roger Revelle and Hans E Suess, 'Carbon Dioxide Exchange Between Atmosphere and Ocean and the Question of an Increase of Atmospheric CO₂ During the Past Decades' (1957) 9 Tellus 18.

⁶ United Nations, Report of the United Nations Conference on the Human Environment, Stockholm, 5–16 June 1972 UN Doc A/CONF.48/14/Rev.1 (1973); World Meteorological Organization, Proceedings of the First World Climate Conference (WMO 1979).

⁷ World Meteorological Organization, Report of the International Conference on the Assessment of the Role of Carbon Dioxide and of Other Greenhouse Gases in Climate Variations and Associated Impacts (Villach, Austria, 9–15 October 1985) (WMO 1986).

⁸ World Commission on Environment and Development, *Our Common Future* (Oxford University Press 1987).

⁹ *Ibi* 49.

¹⁰ Intergovernmental Panel on Climate Change, *Climate Change: The IPCC Scientific Assessment* (Cambridge University Press 1990).

concept of sustainable development and then into international policy; “The Parties have a right to, and should, promote sustainable development” (Article 3).¹¹

In this sense, sustainable development rests upon the assumptions of ecological modernisation theory, which argues that industrial capitalist societies can be reformed to operate in harmony with the environment through improved efficiency, technological innovation and less material and energy intensive production.¹² Central to this perspective is the decoupling hypothesis. This is the belief that continued economic growth can be separated from environmental degradation through technological progress and more efficient resource use. Rather than presenting environmental protection and economic growth as competing objectives, ecological modernisation proposes that they are mutually reinforcing. This intellectual foundation remains central to contemporary green growth strategies.

Building on this foundation, organisations such as the OECD played a central role in translating sustainable development into an explicit economic strategy. The OECD’s *Green Growth Strategy (2011)* reframed environmental challenges not as limits to growth, but as potential drivers of innovation, investment, and new industrial development.¹³ Within this framework, environmental policy actually becomes a mechanism for creating new economic opportunities and incentivising growth whilst reducing environmental fallout. This intellectual trajectory has strongly influenced contemporary climate policy and provides the ideological foundation for what has become known as the green transition.

2.2 The Green Transition and the Need for Critical Minerals

The intellectual trajectory outlined above has been operationalised through what is commonly termed the green transition. The green transition predominantly seeks to curb climate change through a “rapid” decarbonisation of the current economy operationalised through large-scale technological substitution strategies.¹⁴ The foundation of this approach is a large-scale phase-out of fossil-fuel reliance and deployment of renewable energy and low-carbon technologies such as battery storage and electrification.

This emphasis on decarbonisation is reflected in the 2015 Paris Agreement, which commits states to limiting global warming to well below 2°C above pre-industrial levels, while pursuing efforts to limit warming to 1.5°C.¹⁵ Achieving these targets requires substantial reductions in greenhouse gas emissions, placing the decarbonisation of energy, transport and industry at the

¹¹ United Nations Framework Convention on Climate Change (opened for signature 9 May 1992, entered into force 21 March 1994) 1771 UNTS 107.

¹² Arthur P J Mol and Gert Spaargaren, 'Ecological Modernization Theory in Debate: A Review' (2000) 9 *Environmental Politics* 17.

¹³ Organisation for Economic Co-operation and Development, *Towards Green Growth* (OECD Publishing 2011).

¹⁴ International Energy Agency, *Net Zero by 2050: A Roadmap for the Global Energy Sector* (IEA 2021).

¹⁵ Paris Agreement (adopted 12 December 2015, entered into force 4 November 2016) TIAS No 16-1104.

centre of contemporary climate strategy. The Paris Agreement also frames climate action as compatible with economic growth and development and that this should occur “in the context of sustainable development and efforts to eradicate poverty” (Article 2).¹⁶

While renewable energy technologies, battery storage and electric vehicles are low-carbon alternatives to oil and gas, releasing significantly fewer greenhouse gases during their operation, their manufacture is considerably more intensive, relying upon access to a range of so-called "critical minerals", including lithium, cobalt, nickel, copper and rare earth elements¹⁷. According to the International Energy Agency (IEA), a typical electric vehicle requires around six times more mineral inputs than a combustion-engine vehicle, while an onshore wind plant requires approximately nine times more mineral resources than a gas-fired power plant.¹⁸ As investment in renewable energy has expanded, the material requirements have increased accordingly, with the average amount of minerals required per unit of new power generation capacity rising by around 50% since 2010.¹⁹ Consequently, large-scale deployment of renewable energy technologies, electrification and net-zero strategies is expected to drive a substantial increase in demand for critical minerals, leading some commentators to argue that the energy transition represents a shift 'from Big Oil to Big Shovels', reflecting the substantial expansion in mining required to support decarbonisation.²⁰ In a scenario that meets the Paris Agreement goals, their share of total demand rises significantly over the next two decades to over 40% for copper and rare earth elements, 60-70% for nickel and cobalt, and almost 90% for lithium.²¹

The IEA has identified these minerals as essential components of clean energy technologies, arguing that achieving global climate targets will require a rapid and sustained increase in their extraction and processing.²² As these minerals are rare with a low substitutability (meaning few viable alternatives currently exist for low carbon technologies) they have become strategically important commodities.²³ This strategic importance is reinforced by several material and geopolitical constraints.²⁴ Economically viable reserves are geographically concentrated, many critical minerals have limited substitutability within existing low-carbon technologies, and global processing capacity is dominated by a relatively small number of countries.²⁵ Together, these characteristics have heightened concerns over supply security and strengthened the perception of critical minerals as strategic assets rather than ordinary commodities.²⁶ Their presence within national territories can signify great economic potential. Many middle to high income regions,

¹⁶ Ibid

¹⁷ International Energy Agency, *The Role of Critical Minerals in Clean Energy Transitions* (IEA 2021).

¹⁸ Ibid.

¹⁹ Ibid.

²⁰ Daniel Yergin, *The New Map: Energy, Climate and the Clash of Nations* (Penguin 2023).

²¹ International Energy Agency, *The Role of Critical Minerals in Clean Energy Transitions* (IEA 2021).

²² *ibid.*

²³ Ibid.

²⁴ Ibid.

²⁵ *ibid*

²⁶ *ibid*

such as the European Union, United States and China, are increasingly viewing critical minerals as strategic assets necessary for maintaining industrial competitiveness and supporting the transition to net-zero emissions.²⁷ Consequently, contemporary policy debates increasingly focus not only on securing access to mineral reserves, but also on developing resilient supply chains capable of supporting large-scale decarbonisation.²⁸ In this sense, the green transition is replacing dependence on fossil fuels with an increasing dependence upon secure supplies of critical minerals.²⁹ As a result the global demand for these elements is at an all time high.

The rapid expansion of renewable energy, electrification and net-zero strategies therefore depends upon a corresponding expansion in the extraction and processing of critical minerals.³⁰ As climate policy has become increasingly intertwined with industrial policy and resource security, these minerals have moved from relatively niche mining commodities to resources of strategic global importance.³¹ This changing relationship between decarbonisation and resource extraction has generated a growing body of scholarship examining how the expansion of mining should be understood within the broader political economy of the green transition.

2.3 Green Extractivism and Green Capitalism

While dominant policy narratives present expansion for critical mineral extraction as a necessary for decarbonisation, a growing body of scholarship questions how this expansion should be understood within the broader political economy of the green transition. This literature is commonly brought together under the concepts of “green extractivism” and “green capitalism”. The 21st century has been described as the “era of green extractivism”.³² Green extractivism is any form of extractive activity that is justified through the need to provide low-carbon technologies that will solve climate change.³³ Rather than rejecting decarbonisation itself, this literature questions the political and economic assumptions through which the transition is being pursued. It argues that climate change has become a new rationale for expanding mineral extraction, allowing activities that might previously have been contested to be reframed as environmentally necessary.³⁴

The Climatisation of Extractive Industries

²⁷ International Energy Agency, Critical Minerals Market Review 2023 (IEA 2023).

²⁸ *ibid*

²⁹ *ibid*

³⁰ International Energy Agency, (n27)

³¹ International Energy Agency, (n27)

³² Voskoboynik and Andreucc (n2) 809

³³ Alexander Dunlap and Jonas Jakobsen, *The Violent Technologies of Extraction* (Palgrave Macmillan 2020)

³⁴ Voskoboynik and Andreucci (n2) 808.

Some authors have termed this the “climatization of extractive industries”.³⁵ This is where sectors such as mining have “co-opted” the discourse of sustainability to pivot and intensify their activities in the name of decarbonisation.³⁶ In this way, the mining industry positions itself as instrumental to, and inseparable from, the energy transition.³⁷ In these circles there is no question as to the validity of extractivism as it is currently practised,³⁸ and in this way the need for renewable energy infrastructure expands extractive capitalism.³⁹

This argument forms part of a broader critique of green capitalism. Rather than viewing decarbonisation as a departure from existing economic systems, scholars argue that climate change has become a new frontier for capitalist accumulation in which renewable technologies, critical minerals and sustainability itself generate new opportunities for investment, profit and economic expansion.⁴⁰ From this perspective, the green transition does not replace extractivism but re-legitimises it through a new environmental rationale.⁴¹

Green Capitalism and the Appropriation of Nature

Green extractivism is a growing body of scholarship that critiques the practice of appropriating and exploiting nature under the justification of sustainability.⁴² As Dunlap and colleagues put it, “We consider green extractivism to constitute a system of extractive development that harnesses climate change and other socioecological crises as profit-generating and re-branding opportunities.”⁴³ Ramón Grosfoguel describes extractivism as enabled by an attitude of objectification rooted in racial, colonial and capitalist logics that are justified through ideas of techno-industrial progress.⁴⁴ This reflects ideas from human ecology in which nature is understood as humanity's dominion and available for exploitation. It is also reflected in concepts such as “ecosystem services” and “natural resources”, which position nature primarily as a tool for human use. Dunlap and colleagues argue that this becomes a crucial psycho-social and ontological condition for legitimising the degradation of ecosystems.⁴⁵

³⁵ Doris Buu-Sao, Sébastien Chailleux and Sylvain Le Berre, 'Ecological Crisis and Green Capitalism: Toward a Climatization of Extractive Industries?' (2024) 105 *Review of Agricultural, Food and Environmental Studies* 17–43.

³⁶ Matthew Archer and Filipe Calvão, *Sustaining Decarbonisation: Energy Storage, Green Extractivism, and the Future of Mining* (2025) Antipode.

³⁷ Ibid

³⁸ Eduardo Gudynas, 'The New Extractivism of the 21st Century: Ten Urgent Theses about Extractivism in Relation to Current South American Progressivism' in Miriam Lang and Dunia Mokrani (eds), *Beyond Development: Alternative Visions from Latin America* (Transnational Institute and Rosa Luxemburg Foundation 2011) 9

³⁹ Felix Malte Dorn, Robert Hafner and Christina Plank, 'Towards a Climate Change Consensus: How Mining and Agriculture Legitimise Green Extractivism in Argentina' (2022) 11 *The Extractive Industries and Society* 101130.

⁴⁰ Voskoboynik and Andreucci (n2) 809.

⁴¹ Ibid

⁴² Alexander Dunlap, Judith Verweijen and Carlos Tornel, 'The Political Ecologies of "Green" Extractivism(s): An Introduction' (2024) 31(1) *Journal of Political Ecology* 436, 436

⁴³ Ibid 447.

⁴⁴ Ibid 441.

⁴⁵ Ibid

Similarly, Shapiro and McNeish argue that extractivism results from a particular ontological assemblage that separates humans from nature,⁴⁶ while Chagnon and colleagues describe extractivism as a complex ensemble of practices, mentalities and power relations that rationalise socio-ecologically destructive modes of organising life through violence, depletion and non-reciprocity.⁴⁷ Gudynas' applied these critiques of extractivism and applied them to neo-extractivism, arguing that it remains intrinsically an appropriation of nature, exploiting what the land provides in the same way traditional extraction does.⁴⁸ Lithium extraction therefore reproduces historical extractive relationships despite supporting renewable technologies.⁴⁹

From Socio-technical Transitions to Political Economy

Early literature on the green transition was dominated by socio-technical perspectives, which conceptualised critical minerals primarily as enabling resources necessary for decarbonisation and technological transformation.⁵⁰ These approaches largely examine how technological innovation, institutions and policy can facilitate the transition to low-carbon energy systems, often treating critical minerals as supply-chain constraints to be managed through innovation, investment and improved governance.⁵¹

By contrast, political economic perspectives interpret critical minerals as indicative of a broader reconfiguration of extractive capitalism under the green transition.⁵² Rather than treating minerals simply as a technical challenge, these approaches examine how the costs and benefits of extraction are distributed, how existing global inequalities may be reproduced, and whose interests continued mineral extraction ultimately serves.⁵³

This shift from socio-technical to political economy perspectives reflects a broader change within green transition scholarship. Rather than viewing critical minerals solely as inputs required for decarbonisation, growing attention is being paid to the political, economic and territorial implications of expanding extraction.⁵⁴ It is within this latter body of literature that debates over resource governance, value capture and environmental justice have emerged,

⁴⁶ Ibid.

⁴⁷ Chagnon C and others, 'From Extractivism to Global Extractivism: The Evolution of an Organizing Concept' (2022) *Journal of Political Ecology*,

⁴⁸ Gudynas (n38) 1.

⁴⁹ Thea Riofrancos, *Resource Radicals: From Petro-Nationalism to Post-Extractivism in Ecuador* (Duke University Press 2020)

⁵⁰ Frank W Geels, 'Socio-technical Transitions to Sustainability: A Review of Criticisms and Elaborations of the Multi-Level Perspective' (2019) *Current Opinion in Environmental Sustainability*.

⁵¹ Frank W Geels, Frans Berkhout and Detlef P van Vuuren, 'Bridging Analytical Approaches for Low-Carbon Transitions' (2016) 6 *Nature Climate Change* 576–583.

⁵² Gavin Bridge and Ludger Gailing, 'New Energy Spaces: Towards a Geographical Political Economy of Energy Transition' (2020) 52 *Environment and Planning A: Economy and Space* 1037

⁵³ Peter Newell, *Power Shift: The Global Political Economy of Energy Transitions* (Cambridge University Press 2021).

⁵⁴ Bridge and Gailing (n48).

providing the foundation for the competing governance models discussed in the following section.⁵⁵

2.4 Critical Mineral Governance

The previous section demonstrated that the rapid expansion of critical mineral extraction has become increasingly contested within the literature on green extractivism. The question that follows is therefore not simply whether extraction should occur, but how it should be governed and who should benefit from it. Competing governance models offer different answers to these questions, reflecting contrasting assumptions regarding state intervention, market organisation and national development. These debates are particularly significant because environmental justice is shaped not only by environmental impacts, but also by political and economic decisions concerning resource ownership, value distribution and the purposes extraction is intended to serve.

Neoliberal Governance

Resource governance of assets that are strategically significant at the global level has often been characterised by a laissez-faire approach, with deregulation and market liberalisation designed to attract foreign investment and multinational corporations.⁵⁶ Particularly influential across Latin America during the 1980s and 1990s, neoliberal resource governance was promoted through structural adjustment programmes in response to high levels of debt, inflation, and limited domestic technological and investment capacity.⁵⁷ Rather than relying on state ownership and economic planning, mining and energy industries were privatised and market mechanisms were used to allocate investment and organise resource development. This approach was underpinned by the neoliberal principle of comparative advantage, derived from the work of David Ricardo, which suggests that countries maximise economic welfare by specialising in the goods and sectors in which they are relatively most efficient.⁵⁸ Applied to resource-rich economies, this logic encouraged states to specialise in mineral extraction while relying on international markets for higher-value manufactured goods. Within this model, the state's primary role was to facilitate private investment by providing a stable regulatory environment and protecting investor interests.⁵⁹ In return, foreign investment was expected to deliver capital, technological expertise,

⁵⁵ Riofrancos (n49)

⁵⁶ Gavin Bridge, 'Global Production Networks and the Extractive Sector: Governing Resource-Based Development' (2008) 8(3) *Journal of Economic Geography* 389, 391

⁵⁷ Anthony Bebbington, Leonith Hinojosa, Denise Humphreys Bebbington, Maria Luisa Burneo and Ximena Warnaaars, 'Mining and Social Movements: Struggles Over Livelihood and Rural Territorial Development in the Andes' (2008) 39(6) *Development and Change* 887, 888

⁵⁸ David Ricardo, *On the Principles of Political Economy and Taxation* (1817).

⁵⁹ Bridge (n56) 394

employment opportunities, and infrastructure development, thereby stimulating broader economic growth.⁶⁰

However, limited state control enabled a huge amount of potential profit to be exported along with the resources themselves,⁶¹ and weak environmental and social regulations allowed for large scale environmental degradation, exploitation of local labour and conflicts with local communities.⁶² Although this approach invigorates resource-rich economies in the short term, in the long-term critics suggest that it reinforces dependence on volatile commodity markets and external investment.⁶³

These shortcomings prompted increasing calls for greater state involvement in the governance of strategically important natural resources, particularly as critical minerals assumed growing geopolitical and economic importance.⁶⁴

Resource Nationalism

Resource nationalism has emerged as an alternative to neoliberal resource governance, advocating greater state control over natural resources and a larger national share of the economic benefits derived from extraction.⁶⁵ Resource nationalism refers to a governance approach in which states seek greater sovereignty over natural resources to retain a larger share of the profits and advance broader national development objectives.⁶⁶ Governments pursuing this approach typically employ instruments such as higher royalties and taxation, export controls and contract renegotiation.⁶⁷ Stevens argues that these interventions are largely pragmatic responses to changing political and economic conditions rather than expressions of a particular ideology.⁶⁸

Mazzucato argues that governments do not simply correct market failures but actively create and shape markets through public investment, regulation, and mission-oriented innovation.⁶⁹ Within the critical minerals sector this provides an important justification for greater public involvement beyond maximising state revenues, positioning governments as active participants in industrial development and strategic resource governance.⁷⁰

⁶⁰ Ibid

⁶¹ Bridge (n56) 401

⁶² Bebbington and others (n 53) 900

⁶³ Bridge (n56) 408

⁶⁴ Ibid 414.

⁶⁵ Paul Stevens, 'National Oil Companies and International Oil Companies in the Middle East: Under the Shadow of Government and the Resource Nationalism Cycle' (2008) 1(1) *The Journal of World Energy Law & Business* 5, 6.

⁶⁶ Ibid

⁶⁷ Ibid 17

⁶⁸ Ibid 22

⁶⁹ Mariana Mazzucato, *The Entrepreneurial State: Debunking Public vs Private Sector Myths* (Anthem Press 2013) 47–69.

⁷⁰ Mariana Mazzucato, *Mission Economy: A Moonshot Guide to Changing Capitalism* (Allen Lane 2021) 17–37.

Neoextractivism

Governments across the political spectrum have employed large scale extraction and export of natural resources as a national development strategy.⁷¹ Extractivism as an economic development model has broadly taken two forms under the neoliberal and nationalised governance models.⁷² Neoliberal extractivism is dominated by private companies, where revenue primarily flows up to investors and shareholders, resources are exported and involvement of and redistribution through the state is limited.⁷³ This is usually associated closely with the neoliberal governance style but can occur under other regimes. Eduardo Gudynas identifies a second form of extractive behaviour that is termed progressive or neo-extractivism.⁷⁴

Progressive neo-extractivism is a system in which the state is a stronger actor and captures a larger share of the financial gains through a wider range of activities.⁷⁵ In addition to taxation, this can include royalties, lease payments or nationalised extractive enterprises. Importantly these revenues are redistributed through public spending on social programmes and development initiatives.⁷⁶ These social welfare programmes help to justify extractive and environmentally degrading practices which pacifies many members of society and creates social legitimacy.⁷⁷ However, Gudynas argues that these redistributive policies simultaneously legitimise environmentally degrading extractive activities by presenting them as necessary for poverty reduction and social welfare.⁷⁸ Because these programmes remain dependent upon continuing extractive revenues, governments themselves become increasingly dependent upon continued mineral extraction.⁷⁹

Global Value Chain Logic, Dependency and Centre-Periphery Dynamics

Many Latin American governments have promoted resource nationalism and neo-extractivism as a means of capturing a greater proportion of the economic value generated from natural resources and using those revenues to support national development. However, critics argue that increasing state control over resource revenues does not, by itself, overcome structural dependency on commodity exports and foreign demand.⁸⁰

⁷¹ Maristella Svampa, *Neo-Extractivism in Latin America* (Cambridge University Press).

⁷² Gudynas (n38)

⁷³ Ibid 3.

⁷⁴ Ibid 6.

⁷⁵ Ibid.

⁷⁶ Ibid 8.

⁷⁷ Ibid.

⁷⁸ Ibid.

⁷⁹ ibid

⁸⁰ Ibid.

A growing body of literature argues that resource extraction occupies one of the lowest-value positions within global supply chains. Global value chain scholars demonstrate that the greatest economic value is typically captured through downstream activities including processing, manufacturing, technological innovation, branding and intellectual property, rather than at the point of extraction, leaving mineral-producing countries with only a small share of the total value generated.⁸¹

This critique builds upon earlier dependency theory. Prebisch argued that industrialised "core" economies retain higher-value manufacturing and technological production while resource-exporting "peripheral" economies remain dependent upon supplying raw materials. Andre Gunder Frank extended this argument, contending that global capitalism reproduces what he termed the "development of underdevelopment", whilst Fernando Henrique Cardoso adopted a more nuanced position, suggesting that development remains possible under conditions of dependency but is constrained and uneven. Similarly, Samir Amin argued that value is systematically transferred from the periphery to the core, making critical minerals another frontier of global capitalist accumulation.⁸²

Consequently, mining often operates as an "enclave economy", in which extraction is spatially and economically disconnected from the wider domestic economy. While minerals are exported and profits frequently repatriated to multinational firms, relatively little value is retained through domestic processing, manufacturing or technological development. This unequal distribution of value reflects broader patterns of unequal exchange, whereby high-income economies act as net appropriators of embodied materials, energy and labour from the Global South, reinforcing a persistent resource drain.⁸³

These structural dynamics are reflected in the literature on the concept of the "resource curse", whereby counter to the competitive advantage logic, dependence upon commodity exports increases vulnerability to price volatility, discourages industrial diversification and concentrates economic activity within low-value extractive sectors.⁸⁴ Therefore reliance on neo-extractivism ultimately maintains South America's subordinate position within the global economy despite increasing state participation.⁸⁵

⁸¹ Gereffi G, Humphrey J and Sturgeon T, 'The Governance of Global Value Chains' (2005) 12(1) *Review of International Political Economy* 78–104; Kaplinsky R and Morris M, *A Handbook for Value Chain Research* (IDRC 2001).

⁸² Prebisch R, *The Economic Development of Latin America and its Principal Problems* (United Nations 1950); Frank AG, *Capitalism and Underdevelopment in Latin America* (Monthly Review Press 1967); Cardoso FH and Faletto E, *Dependency and Development in Latin America* (University of California Press 1979); Amin S, *Accumulation on a World Scale: A Critique of the Theory of Underdevelopment* (Monthly Review Press 1974).

⁸³ Bridge G, 'Global Production Networks and the Extractive Sector: Governing Resource-Based Development' (2008) 8(3) *Journal of Economic Geography* 389; Deva S and Anand S

⁸⁴ Auty RM, *Sustaining Development in Mineral Economies: The Resource Curse Thesis* (Routledge 1993); Sachs JD and Warner AM, 'Natural Resource Abundance and Economic Growth' (NBER Working Paper No 5398, 1995).

⁸⁵ Gudynas (n38).

To overcome these structural limitations, Prebisch advocated import-substitution industrialisation, whilst Celso Furtado similarly argued that development requires transforming productive structures through domestic industrial and technological capacity rather than simply increasing extraction.⁸⁶ Building upon this tradition, Riofrancos argues that resource nationalism should encompass more than increasing state ownership or capturing higher revenues. Instead, she advocates a model of "radical resource nationalism", combining public ownership, domestic industrial development, democratic participation and environmental justice in order to reshape how value is created and distributed throughout critical mineral supply chains.⁸⁷

2.5 Environmental Justice Approach

Human rights and environmental justice are inseparable, as argued by Pellow, who emphasises that environmental harms are always also human rights issues, particularly in relation to labour conditions, community wellbeing, and exposure to environmental risk. Environmental justice itself emerged from the civil rights movements in the United States in response to environmental racism and the disproportionate exposure of marginalised communities to toxic waste dumping in the 1980s. Although initially rooted in struggles against environmental racism, Environmental Justice has since evolved into a multidisciplinary framework concerned with the equitable distribution of environmental benefits and burdens, meaningful participation in environmental decision-making, and the recognition of diverse identities, values and knowledge systems. Increasingly, the framework has been applied beyond its original United States context to examine global environmental governance, climate justice and extractive industries, making it particularly relevant to the study of critical mineral extraction.⁸⁸

Following the rapid expansion of critical mineral mining and broader debates around the green transition in the 2010s, environmental justice scholars increasingly engaged with socio-technical transition literature, critiquing it for prioritising technological solutions while underestimating the social, territorial, and ecological harms associated with extraction.⁸⁹

Although Bullard is credited with establishing the field, it is Schlosberg who provides the most widely used contemporary framework for environmental justice, moving the concept beyond a narrow focus on unequal distribution. Schlosberg argues that environmental justice must instead be understood as comprising three interrelated dimensions: distributional, procedural, and recognitional justice. Whilst early Environmental Justice scholarship focused primarily upon the

⁸⁶ Prebisch (n 60); Furtado C, *Economic Development of Latin America* (Cambridge University Press 1970).

⁸⁷ Riofrancos (n49)

⁸⁸ David N Pellow, *What Is Critical Environmental Justice?* (Polity Press 2018); Robert D Bullard, *Dumping in Dixie: Race, Class and Environmental Quality* (3rd edn, Westview Press 2000); David Schlosberg, *Defining Environmental Justice: Theories, Movements and Nature* (OUP 2007).

⁸⁹ Healy N and Barry J, 'Politicizing Energy Justice and Energy System Transitions' (2017) 8 *Energy Policy* 451; Sovacool BK and Dworkin MH, *Global Energy Justice* (Cambridge University Press 2015).

unequal distribution of environmental harms and benefits, Schlosberg argues that distribution alone cannot explain why particular communities repeatedly experience environmental injustice. Instead, unequal environmental outcomes are produced through interconnected processes of political exclusion, institutional power and cultural misrecognition. His tripartite framework therefore conceptualises distributional, procedural and recognitional justice as mutually reinforcing rather than independent dimensions of justice.⁹⁰

Procedural justice concerns the extent to which affected communities are able to participate meaningfully in environmental decision-making, including access to information, consultation processes, free, prior and informed consent, and actual influence over governance outcomes.⁹¹ Walker further emphasises that such participation is shaped by institutional arrangements and broader spatial inequalities, meaning that governance structures themselves often reproduce uneven power relations.⁹² In this context, Martin and Wood highlights how procedural justice failures can reflect the over-representation of Western epistemologies and decision-making norms in environmental governance.⁹³ Extending this critique, Barca argues that just transitions must also include workers in decision-making processes, not only local or Indigenous communities, thereby linking procedural justice to labour politics and the organisation of production.⁹⁴

Recognitional justice, drawing on the work of Fraser and further developed within environmental justice scholarship by Schlosberg, extends beyond participation to examine whether the identities, cultures, values, and knowledge systems of affected communities are acknowledged and respected.⁹⁵ This dimension is particularly significant in contexts involving Indigenous peoples, where environmental conflicts often reflect fundamentally different ontologies of land, water, and territory. Recognitional justice therefore highlights that environmental conflict is not only about access or distribution, but whether different ontologies and knowledge systems are recognised as legitimate within environmental governance. Many Environmental Justice scholars argue that recognitional justice forms the foundation upon which meaningful procedural and distributional justice depend. Communities whose identities, knowledge systems and relationships with the environment are not respected with full recognition are less likely to participate as equal partners within governance processes and are more likely to experience the unequal distributions of environmental benefits and burdens.⁹⁶

⁹⁰ Schlosberg D, *Defining Environmental Justice: Theories, Movements and Nature* (OUP 2007).

⁹¹ Julie Sze, *Environmental Justice in a Moment of Danger* (University of California Press 2020).

⁹² Walker G, *Environmental Justice: Concepts, Evidence and Politics* (Routledge 2012).

⁹³ William San Martin and Nathan Wood, 'Pluralising Planetary Justice beyond the North-South Divide: Recentring Procedural, Epistemic, and Recognition-Based Justice in Earth System Governance' (2022) 128 *Environmental Science & Policy* 256–263.

⁹⁴ Barca S, *Workers of the Earth: Labour, Ecology and Reproduction in the Age of Climate Change* (Pluto Press 2024).

⁹⁵ Nancy Fraser, *Justice Interruptus: Critical Reflections on the "Postsocialist" Condition* (Routledge 1997); Schlosberg (n90)

⁹⁶ Schlosberg (n90); Walker G, *Environmental Justice: Concepts, Evidence and Politics* (Routledge 2012).

Finally, distributional justice remains central but is increasingly understood in relation to broader structural inequalities.⁹⁷ Here, Martinez-Alier's concept of ecological distribution conflicts is particularly relevant, as it emphasises how environmental burdens and resource extraction are systematically displaced onto marginalised communities and regions.⁹⁸ This connects closely with Barca's argument that the green transition must be understood in relation to historical inequalities, rather than as a purely forward-looking technological shift.⁹⁹ Taken together, these approaches demonstrate that environmental justice is not only concerned with the distribution of environmental harms, but with the political, cultural, and historical conditions through which those harms are produced and legitimised.¹⁰⁰

Accordingly, Environmental Justice provides a comprehensive framework for analysing critical mineral extraction by examining not only how environmental harms and benefits are distributed, but also who participates in decisions governing extraction and whose identities, values and knowledge systems are recognised within those processes. As such, it offers an important lens through which to understand the social and environmental conflicts associated with the green transition. These concerns intersect with a growing body of scholarship on sacrifice zones, explored in the following section.

2.6 Sacrifice Zones, Unequal Geographies, Impacts and Territorial Conflicts

Sacrifice Zones and Unequal Geographies

Regardless of whether extractive industries are governed through neoliberal or more interventionist models, scholars generally agree that large-scale mineral extraction continues to produce profound socio-environmental consequences. Whilst governance models differ in how the economic benefits of extraction are distributed, they do not fundamentally eliminate the environmental transformations associated with mining. As demand for critical minerals has accelerated under the green transition, a growing body of scholarship argues that these impacts are increasingly concentrated within particular territories, raising broader questions about the unequal geographies of decarbonisation.¹⁰¹

There are certain areas in the world that are treated as expendable by our economic and political systems. Areas in which communities bear a disproportionate share of the environmental, social

⁹⁷ Schlosberg (n90).

⁹⁸ Martinez-Alier J, *The Environmentalism of the Poor: A Study of Ecological Conflicts and Valuation* (Edward Elgar 2002).

⁹⁹ Barca S, *Workers of the Earth: Labour, Ecology and Reproduction in the Age of Climate Change* (Pluto Press 2024).

¹⁰⁰ Schlosberg (n90); Martinez-Alier (n 76); Barca (n 77).

¹⁰¹ Gudynas (n38); Voskoboynik and Andreucci (n2)

and health costs for the benefit of a few. These areas are ‘sacrifice zones’, areas that are condemned for the sake of private interests or for the sake of curbing climate change on a large scale. In these zones the human costs are high and residents suffer devastating physical and mental health consequences and human rights violations as a result of living in pollution hotspots and environmentally degraded areas.¹⁰²

Although sacrifice zones have historically been associated with heavy industry and fossil fuel extraction, scholars increasingly argue that the expansion of renewable energy infrastructure and critical mineral mining is creating a new generation of "green sacrifice zones". From this perspective, the green transition does not eliminate the geographies of sacrifice associated with fossil fuel extraction but instead reorganises them around new resource frontiers and critical mineral supply chains.¹⁰³

Political ecologists further argue that the environmental costs of extraction are not randomly distributed but are spatially organised through existing political, economic and historical inequalities. Rather than being shared equally, the ecological burdens associated with extraction become concentrated within particular regions, communities and ecosystems, whilst many of the economic, technological and environmental benefits are realised elsewhere. Consequently, the green transition reproduces unequal geographies in which the costs and benefits of decarbonisation are experienced unevenly across space.

¹⁰⁴

Many authors suggest that the transition from fossil fuel extraction to critical mineral extraction creates a new resource frontier of appropriation but does not eliminate the environmental impacts of energy production, instead reshaping the geographies of extraction and creating new extractive landscapes. These landscapes are overwhelmingly located within the Global South, where environmental costs are disproportionately borne by marginalised communities along existing lines of inequality. Martinez-Alier conceptualises these dynamics as ecological distribution conflicts, demonstrating how environmental burdens are systematically displaced onto vulnerable communities. This also reflects broader global political-economic decisions that have historically justified the outsourcing of environmental harms to the Global South through economic and racialised logics of development.¹⁰⁵

Environmental and Human Rights Impacts

¹⁰² Boyd DR, *The Right to a Healthy Environment: A User's Guide* (UN Special Rapporteur on Human Rights and the Environment 2023).

¹⁰³ Temper L, Del Bene D and Martinez-Alier J, 'Mapping the Frontiers and Front Lines of Global Environmental Justice: The EJAtlas' (2015) *Journal of Political Ecology*; Dunlap and other (n43)

¹⁰⁴ Walker G, *Environmental Justice: Concepts, Evidence and Politics* (Routledge 2012); Martinez-Alier J, *The Environmentalism of the Poor* (Edward Elgar 2002).

¹⁰⁵ Bridge and Gailing (n4); Bebbington A and Bury J (eds), *Subterranean Struggles: New Dynamics of Mining, Oil, and Gas in Latin America* (University of Texas Press 2013); Martinez-Alier (n 76)

In the context of mining, pollution, water contamination, excessive water consumption, biodiversity loss, ecosystem degradation and landscape fragmentation have long characterised extractive industries. Green extractivism has therefore inherited many of the socio-environmental burdens historically associated with conventional extractivism rather than fundamentally transforming them.¹⁰⁶

It is well established that extractive industries have also benefited from weakened labour, environmental and territorial regulation. Communities living in mining regions frequently experience health crises associated with pollution and contamination, alongside food insecurity, water insecurity, cultural erosion and displacement. Human rights abuses within critical mineral supply chains may also include exploitative labour conditions, child labour and wages that fail to lift workers out of poverty. Despite persistent claims that extractive investment promotes employment and development, critics argue that these benefits are often accompanied by precarious working conditions and entrenched inequalities, particularly where extraction occurs within the Global South.¹⁰⁷

Territorial Conflicts

Beyond environmental degradation, extractive industries fundamentally transform the territories in which they operate. Large-scale mining projects are frequently located within remote or peripheral regions, where infrastructure development and resource extraction reshape existing landscapes and territorial relations. Gudynas argues that extractive activities often replace diverse local economies with productive export enclaves, appropriating land and exacerbating poverty amongst surrounding communities. Rather than being integrated into local economies, these enclaves are primarily connected through transport and energy corridors to international markets and ports, facilitating the export of resources whilst limiting opportunities for broader regional development.¹⁰⁸

Many of these territories are also ancestral homelands of Indigenous peoples. Arturo Escobar argues that Indigenous communities frequently maintain fundamentally different relationships with land, water and territory than those assumed within extractive capitalism.¹⁰⁹ Land is not understood solely as an economic resource but also as the basis of cultural identity, spirituality and community wellbeing.¹¹⁰ Consequently, conventional economic valuations often fail to

¹⁰⁶ Archer S and Calvão (n36); Riofrancos (n49); Svampa M, *Neo-Extractivism in Latin America* (Cambridge University Press 2019).

¹⁰⁷ Gudynas (n38); Sovacool BK, Hook A, Martiskainen M and Brock A, 'The Decarbonisation Divide: Contextualizing Landscapes of Low-Carbon Exploitation and Toxicity in Africa' (2020) *Global Environmental Change*; Sovacool BK, 'The Precarious Political Economy of Cobalt: Balancing Prosperity, Poverty, and Brutality in Artisanal and Industrial Mining in the Democratic Republic of the Congo' (2019) *The Extractive Industries and Society*.

¹⁰⁸ Gudynas (n38)

¹⁰⁹ Escobar A, *Territories of Difference: Place, Movements, Life, Redes* (Duke University Press 2008).

¹¹⁰ Bebbington and Bury (n105).

account for the cultural, spiritual and environmental losses experienced by Indigenous peoples, who disproportionately bear the costs of mining.

¹¹¹

From this perspective, extractivism is not only an economic process but also a territorial one. By appropriating land for resource extraction, mining projects transform existing territorial relations into capitalist spaces of production, deterring or displacing alternative ways of living and weakening community ties, regional economies and Indigenous cultures. In some cases, these processes result in dispossession and forced displacement.

¹¹²

Gudynas further observes that extractive enclaves are often characterised by an uneven presence of the state. Whilst governments may struggle to provide public services or guarantee the rights of citizens within surrounding territories, they frequently deploy police and military forces to protect extractive infrastructure and maintain investment security.¹¹³

Many scholars argue that these dynamics reproduce colonial patterns of domination and constitute new forms of economic imperialism.¹¹⁴ Violations of human rights committed in the construction of renewable energy infrastructure have therefore been characterised as forms of "carbon colonialism" and "green authoritarianism".¹¹⁵ Rather than representing a complete break from previous extractive models, critics argue that the green transition risks reproducing longstanding colonial relationships through new technologies, new resource frontiers and new forms of environmental sacrifice.

2.7 Literature Gaps

The preceding sections demonstrate that the literature surrounding the green transition, critical minerals and environmental justice has expanded considerably over the past decade. However, these bodies of literature have largely developed in parallel rather than in conversation with one another. Research on the green transition primarily asks what minerals are required to achieve decarbonisation; governance scholarship asks who should own, control and benefit from those minerals; whilst environmental justice scholarship asks who bears the environmental and social costs of extraction. Comparatively little research brings these questions together to examine how legal governance shapes environmental justice outcomes within the green transition. Scholars have generated substantial critiques of green extractivism, explored competing models of mineral governance and developed increasingly sophisticated environmental justice frameworks for

¹¹¹ Martinez-Alier J, *The Environmentalism of the Poor* (Edward Elgar 2002); Riofrancos (n49)

¹¹² Escobar (n105)

¹¹³ Gudynas (n135)

¹¹⁴ Suwandi I, *Value Chains: The New Economic Imperialism* (Monthly Review Press 2019).

¹¹⁵ Dunlap A, Verweijen J and Tornel C (n43)

understanding the unequal social and environmental consequences of extraction. However, these bodies of literature often remain fragmented.¹¹⁶

This fragmentation is particularly evident within the dominant institutional literature on the green transition, which continues to prioritise the technical challenge of decarbonisation through renewable energy deployment, emissions reductions and supply security. Consequently, much of this literature focuses on demand-side transitions, technological innovation and resource security, whilst giving comparatively little attention to the supply-side realities of extraction and the environmental and social consequences required to enable these transitions. As discussed throughout this chapter, this creates the impression that renewable energy represents a "clean" transition rather than one that redistributes environmental burdens to new territories. Questions of extraction, environmental justice and community impacts therefore remain peripheral to many mainstream discussions of the green transition.¹¹⁷

This fragmentation is also reflected within the governance literature. Existing debates have largely centred upon questions of who should own, control and benefit from critical mineral extraction, contrasting neoliberal governance with various forms of resource nationalism, state ownership and neo-extractivism. Whilst these debates provide valuable insights into sovereignty, industrial policy, value capture and economic development, comparatively less attention has been paid to whether different governance arrangements actually produce more environmentally just outcomes in practice. Questions concerning distributional, procedural and recognitional justice are often secondary to debates surrounding resource control and revenue capture. Consequently, there remains limited understanding of whether changes in governance models translate into tangible improvements for the communities and ecosystems most directly affected by extraction.¹¹⁸

A further limitation concerns the geographical and epistemological foundations of the literature itself. Much of the critical scholarship informing this dissertation originates from Latin American political ecology and development traditions. Rather than treating critical mineral extraction primarily as a technological or governance challenge, these scholars situate contemporary mining within longer histories of colonialism, dependency, territorial dispossession and unequal development. This perspective is particularly significant because it shifts analytical attention away from questions of technological transition towards questions of power, territory and justice. However, the literature has also become increasingly self-reflective regarding whose knowledge is represented within these debates. Gomez-Barris identifies a persistent bias towards documents produced by international organisations and scholars from industrialised countries, arguing that Indigenous perspectives, Global South scholarship and feminist and racial analyses frequently

¹¹⁶ Bridges and Gailing (n4)

¹¹⁷ International Energy Agency, *The Role of Critical Minerals in Clean Energy Transitions* (2021); Archer S and Calvão (n36)

¹¹⁸ Riofrancos (n49)

remain "submerged" within dominant academic and policy debates.¹¹⁹ Consequently, there have been growing calls for research that foregrounds knowledge produced within producer countries and by communities directly affected by extraction.

Finally, whilst existing scholarship has generated compelling critiques of green extractivism and documented the environmental and social consequences of critical mineral extraction, comparatively little research has examined whether the legal and institutional frameworks governing extraction are themselves structurally capable of preventing environmental injustice. Bastida argues that existing research has paid insufficient attention to the structural limitations of contemporary mining governance and to how regulatory frameworks might be redesigned to better integrate environmental protection and the right to a clean, healthy and sustainable environment within mineral governance¹²⁰. Although anti-extractivist scholarship has also questioned the long-term viability of extractive development, Riofrancos argues that visions of a "post-extractive society" often remain indeterminate, raising broader political-economic questions regarding how states might replace mining revenues, diversify their economies and meet future energy demands. Whilst these debates remain important, they extend beyond the scope of this dissertation.¹²¹

This dissertation therefore seeks to contribute to the existing literature in four ways. First, it brings together the previously fragmented literatures on the green transition, green extractivism, critical mineral governance and environmental justice within a single analytical framework. Second, it shifts attention away from debates centred solely upon ownership, resource control and value capture to examine the environmental justice outcomes produced by different governance arrangements. Third, by drawing extensively upon Latin American political ecology alongside international legal scholarship, it foregrounds perspectives originating from producer countries that have often been marginalised within dominant academic and policy debates on the green transition. Finally, through a case study of lithium extraction in Chile's Salar de Atacama, it examines the extent to which existing international and domestic legal frameworks are capable of reconciling critical mineral extraction with environmental justice, thereby contributing to a more integrated understanding of both the possibilities and the structural limitations of law within the green transition.

Chapter 3 - Methodology and Analytical Framework

3.1 Research Philosophy and Positionality

¹¹⁹ Marisol Gómez-Barris, *The Extractive Zone: Social Ecologies and Decolonial Perspectives* (Duke University Press 2017).

¹²⁰ Ana Elizabeth Bastida, 'Redesigning Mineral Regimes to Strengthen the Environmental Rule of Law: A Case Study on Lithium in Brines' (2024) 33(3) *Review of European, Comparative & International Environmental Law* 633–646.

¹²¹ *Resource Radicals* (Duke University Press 2020)

Having established a picture of the current knowledge landscape from different perspectives on this topic, this chapter explains how I will build an analytical framework capable of addressing the research question. It outlines the research philosophy, case selection, methods of data collection and analytical approach used to examine whether existing governance frameworks are capable of reconciling critical mineral extraction with environmental justice.

Rather than attempting to test a single theoretical perspective, this research adopts an interdisciplinary approach combining environmental justice, political ecology and legal analysis. Although debates surrounding capitalism, dependency and development provide the wider political-economic context, the empirical analysis is principally structured through an environmental justice framework because it offers a practical means of evaluating how governance systems distribute environmental harms and benefits, structure participation and recognise Indigenous rights. These broader theoretical debates are revisited in the discussion chapter to situate the findings within wider debates surrounding the political economy of the green transition.

This research is situated within a critical political ecology perspective, which understands environmental governance as being shaped by unequal power relations and questions assumptions that technological innovation alone can resolve the climate crisis. Political ecology provides the overarching philosophical lens through which the political economy of the green transition is understood, whilst environmental justice provides the principal analytical framework through which the case study is evaluated. It is informed by scholarship on climate justice, sufficiency and critiques of extractivism, while recognising the genuine dilemma posed by critical minerals. Decarbonisation requires substantial quantities of the transition minerals needed to build, store and convey renewable energy, yet their extraction can reproduce longstanding patterns of environmental degradation, exploitation and dependency. The purpose of this research is therefore not to argue against renewable energy or the energy transition itself, but to examine whether existing governance frameworks are capable of reconciling decarbonisation with environmental justice.

This interdisciplinary approach also responds directly to the fragmentation identified within the existing literature. Rather than examining the green transition, critical mineral governance or environmental justice in isolation, this research integrates these perspectives through a legal environmental justice framework. In doing so, it moves beyond debates centred on resource control and value capture and examines whether different governance arrangements produce tangible environmental justice outcomes for affected communities

3.2 Research Design

This dissertation employs a qualitative single-case study of lithium extraction in Chile's Salar de Atacama. A qualitative approach is appropriate because the research seeks to examine questions of governance, rights, participation and justice rather than measure causal relationships or quantify environmental impacts. These questions are embedded within legal frameworks, policy documents and institutional practices, making qualitative document analysis the most appropriate methodology.

The research adopts a multidisciplinary approach, drawing upon environmental law, political economy, anthropology, sociology, environmental governance and environmental science. This reflects the inherently interdisciplinary nature of environmental justice, which requires consideration not only of legal rights but also ecological systems, political institutions and social relations.

The research relies exclusively on documentary analysis. Rather than generating primary data through interviews, it critically analyses legal instruments, government policy, corporate disclosures, NGO reports and existing academic research to examine how environmental justice is constructed and implemented within Chile's lithium governance.

3.3 Case Selection

The Salar de Atacama was selected as a critical case study because it represents one of the world's most significant sites of lithium production and sits at the intersection of several contemporary global challenges. Lithium extracted from the Salar contributes directly to battery production and therefore to international decarbonisation efforts, while simultaneously raising questions regarding Indigenous rights, water governance, biodiversity conservation and environmental justice.

The Salar is therefore much more than a mineral deposit. It represents the intersection of global climate policy, political economy, fragile desert ecology and Indigenous territorial governance. This makes it particularly well suited to examining whether the green transition is capable of reconciling climate objectives with environmental justice.

Importantly, the Salar de Atacama was not selected because it represents the worst example of environmental injustice or human rights abuse. Instead, it was deliberately chosen because Chile possesses one of the more sophisticated governance systems for lithium extraction. It combines relatively strong state involvement through resource nationalism, an established environmental assessment system, internationally recognised Indigenous rights protections through ILO Convention 169, and extensive integration within global battery supply chains. If Environmental

Justice tensions persist under a wide range of governance arrangements, this raises broader questions regarding the capacity of existing legal frameworks to deliver a just transition elsewhere.

The case also provides an important Global South perspective. The selection of the Salar de Atacama also reflects the dissertation's engagement with Latin American political ecology and scholarship originating from producer countries. Rather than relying exclusively upon institutional or Global North perspectives, the research deliberately draws upon scholars whose work is grounded in the social, political and ecological realities of extractive regions. This approach responds to recent calls to foreground perspectives that have often remained comparatively underrepresented within dominant international debates surrounding the green transition.

The selection of this topic was also informed by my previous professional experience as a journalist covering innovations and solutions to climate change. During interviews with companies involved in electrification and renewable technologies, discussions surrounding mineral supply chains were frequently vague or treated as an after thought or distraction from the decarbonisation narrative. While these observations are anecdotal and do not constitute research evidence, they informed the development of the research question by highlighting the relative absence of critical discussion surrounding the extractive foundations of the green transition.

3.4 Data Collection

The dissertation is based entirely upon documentary analysis. Primary sources include international legal instruments, Chilean legislation, government policy documents, environmental assessment procedures and corporate sustainability reports published by SQM and Albemarle. These documents provide the legal and institutional basis through which lithium extraction is governed.

To complement official sources, the research also analyses reports produced by international organisations and non-governmental organisations, alongside academic books and peer-reviewed journal articles spanning environmental justice, Indigenous rights, political ecology, environmental governance and development studies.

As primary interviews were beyond the scope of this research, Indigenous perspectives have been incorporated through previously published qualitative research, particularly interviews conducted by Lorca and Jerez and colleagues, together with reputable news sources which document community experiences and responses to lithium extraction. Particular emphasis has also been placed on incorporating scholarship produced by Latin American researchers alongside reports from Indigenous organisations, local NGOs and previously published qualitative research

documenting community perspectives. This reflects growing recognition within the literature that knowledge gathered within producer countries has remained comparatively underrepresented within dominant international debates concerning critical minerals and the green transition.

To strengthen the credibility of the analysis, evidence has been triangulated across multiple source types. Comparing legal texts, government documents, corporate reporting, academic literature, NGO publications and community accounts enables areas of consistency and contradiction to be identified while reducing reliance upon any single perspective.

3.5 Analytical Framework

The analytical framework is grounded in environmental justice theory. Following Schlosberg, environmental justice is understood as extending beyond the distribution of environmental harms to include procedural justice and recognitional justice. These three dimensions provide the principal analytical categories used throughout the analysis.

Distributional justice examines how the environmental costs and economic benefits of lithium extraction are allocated. Procedural justice evaluates whether Indigenous communities are able to participate meaningfully in environmental decision-making, focusing particularly upon consultation processes, access to information and free, prior and informed consent and access to seek justice. Recognitional justice considers whether Indigenous identities, governance systems, cultural relationships with territory and knowledge systems are adequately recognised within environmental governance.

These analytical categories are then evaluated against the principal legal frameworks governing lithium extraction: ILO Convention 169, the United Nations Declaration on the Rights of Indigenous Peoples, the Escazú Agreement and Chile's Environmental Framework Law (Law 19.300). Together these frameworks enable an assessment not only of whether environmental justice principles are recognised within law, but also whether existing governance arrangements are capable of delivering environmentally-just outcomes in practice.

3.6 Scope and Limitations

Whilst informed by broader debates surrounding political ecology, post-extractivism and dependency, the empirical scope of this dissertation is deliberately narrower. Rather than attempting to resolve wider debates surrounding post-extractivism, degrowth or alternative models of economic development, the analysis applies a legal environmental justice framework to examine whether existing legal and governance arrangements are capable of reconciling critical mineral extraction with environmental justice and offering recommendations for strengthening governance where it appears to fall short.

Several limitations should be acknowledged. Firstly, this dissertation relies exclusively upon documentary evidence and therefore does not generate original empirical data through interviews or fieldwork. While community perspectives have been incorporated through existing qualitative research, direct engagement with affected communities would provide additional insight into lived experiences of lithium extraction.

Second, the research does not attempt to provide a comprehensive assessment of all dimensions of mining governance. Due to constraints of scope, the analysis concentrates on environmental governance, Indigenous rights and resource governance because these themes dominate both the academic literature concerning the Salar de Atacama and debates surrounding Chile's National Lithium Strategy. Other important areas, including labour rights, corporate governance, biodiversity law and wider environmental treaties such as the Convention on Biological Diversity and the Ramsar Convention, fall beyond the scope of this dissertation.

Thirdly, limitations of space meant that the dissertation was unable to examine the contribution of mining and critical mineral supply chains to global greenhouse gas emissions in greater depth. In particular, it does not explore how these emissions are incorporated within Nationally Determined Contributions (NDCs) under the Paris Agreement. Examining the interaction between the global climate benefits of critical minerals and the industry's own contribution to climate change would provide a valuable avenue for future research, particularly in understanding the relationship between local environmental justice impacts and the global climate governance objectives that drive increasing demand for transition minerals.

Finally, the governance of lithium extraction in Chile continues to evolve. The analysis reflects legislation and policy in force at the time of writing, recognising that future political and technical developments may alter aspects of Chile's resource governance framework. Consequently, the conclusions should be understood as an assessment of the current governance landscape rather than a prediction of future policy trajectories.

Chapter 4 - Legal and Policy Frameworks

There are numerous international treaties, protocols, declarations, resolutions and governance frameworks relevant to the relationship between climate transition, mineral extraction and environmental justice. However, these frameworks operate largely within separate institutional systems, with limited mechanisms linking climate governance, human rights protection and extractive regulation.

This thesis focuses on the legal frameworks most directly relevant to the analysis of distributional, procedural and recognitional justice in lithium extraction in the Salar de Atacama: the United Nations Framework Convention on Climate Change (UNFCCC)¹²² and Paris Agreement¹²³ as the foundational climate governance framework; the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP)¹²⁴; the International Labour Organization Convention No.169 on Indigenous and Tribal Peoples (ILO 169)¹²⁵; the Escazú Agreement¹²⁶ on environmental democracy; and Chilean Law 19.300¹²⁷, Law 20.417¹²⁸, Law 20.600¹²⁹ and Environmental Impact Assessment System (SEIA).¹³⁰

These frameworks were selected because they represent the multi-level layers through which lithium extraction is governed. In particular, this thesis refers to the international climate commitments driving demand for critical minerals, national Indigenous rights, regional environmental governance, and domestic implementation mechanisms. Other relevant instruments, including Chile's Mining Code, Water Code and emerging recognition of the right to a clean, healthy and sustainable environment, are considered where relevant to specific aspects of the analysis but are not treated as primary frameworks.

4.1 Climate Governance: The UNFCCC and Paris Agreement

The global expansion of lithium extraction is closely connected to international climate governance and the transition towards renewable energy systems. The UNFCCC (1992) provides the foundational framework for international climate cooperation, establishing the institutional architecture through which states coordinate efforts to reduce greenhouse gas emissions.¹³¹ The Paris Agreement (2015), adopted under the UNFCCC framework and entered into force in 2016, operationalises these commitments through Nationally Determined Contributions (NDCs), which require states to establish and periodically update their climate targets.¹³²

¹²² United Nations Framework Convention on Climate Change (adopted 9 May 1992, entered into force 21 March 1994) 1771 UNTS 107.

¹²³ Paris Agreement (adopted 12 December 2015, entered into force 4 November 2016) (2016) TIAS No 16-1104.

¹²⁴ United Nations Declaration on the Rights of Indigenous Peoples, GA Res 61/295, UNGAOR, 61st Sess, Supp No 49, UN Doc A/RES/61/295 (13 September 2007).

¹²⁵ Indigenous and Tribal Peoples Convention (No 169) (adopted 27 June 1989, entered into force 5 September 1991) 1650 UNTS 383.

¹²⁶ Regional Agreement on Access to Information, Public Participation and Justice in Environmental Matters in Latin America and the Caribbean (adopted 4 March 2018, entered into force 22 April 2021).

¹²⁷ Law No 19.300 on General Bases of the Environment (Chile, 1994).

¹²⁸ Law No 20.417 Creating the Ministry of the Environment, Environmental Assessment Service and Superintendence of the Environment (Chile, 2010).

¹²⁹ Law No 20.600 Establishing the Environmental Courts (Chile, 2012).

¹³⁰ Law No 19.300 on General Bases of the Environment (Chile, 1994).

¹³¹ United Nations Framework Convention on Climate Change (adopted 9 May 1992, entered into force 21 March 1994) 1771 UNTS 107.

¹³² Paris Agreement (adopted 12 Dec 2015, entered into force 4 Nov 2016) (2016) TIAS No 16-1104, art 4.

Although the Paris Agreement is legally binding in relation to procedural obligations, including submitting NDCs and reporting progress, it does not impose binding emissions outcomes or provide enforcement mechanisms for failure to achieve targets.¹³³ More importantly for this thesis, the climate governance regime remains largely separate from international human rights governance. While the Paris Agreement recognises human rights in its preamble,¹³⁴ this reference does not establish enforceable obligations regarding Indigenous rights, environmental justice or the impacts of mineral extraction and related supply chains.

Within the current NDC's, Chile commits to economy-wide greenhouse gas mitigation and a transition towards a carbon-neutral economy. Although lithium mining is not itself governed by the NDCs, the transition it promotes has substantially increased demand for critical minerals required for renewable energy technologies and electric vehicles.¹³⁵ However, it does not contain provisions governing Indigenous consultation, free prior and informed consent, water rights or the environmental impacts associated with mining.¹³⁶ This creates a significant governance gap. International, overarching climate frameworks generate demand for minerals required for decarbonisation, but they do not directly regulate the social and environmental consequences of obtaining those minerals.¹³⁷

4.2 International Human Rights Instruments

4.2.1. United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP)

The United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP), adopted in 2007, was designed to give a normative framework for Indigenous rights globally.¹³⁸ By establishing shared values and principles, although not legally binding, UNDRIP is an influential reference point for interpreting Indigenous peoples' rights to self-determination and identity, cultural preservation and control over traditional lands, territories and resources.

Articles 25 and 26 recognise the importance of Indigenous relationships with ancestral territories, while Article 32 establishes that states should consult and cooperate with Indigenous peoples in order to obtain their free, prior and informed consent before approving projects affecting their lands, territories and resources.¹³⁹

¹³³ Paris Agreement arts 4 and 13.

¹³⁴ Paris Agreement preamble.

¹³⁵ Government of Chile, Nationally Determined Contribution: Updated Nationally Determined Contribution 2020 (Ministry of the Environment 2020). 18-29.

¹³⁶ Ibid

¹³⁷ International Energy Agency, The Role of Critical Minerals in Clean Energy Transitions (IEA 2021) 21–39.

¹³⁸ United Nations Declaration on the Rights of Indigenous Peoples, GA Res 61/295, UNGAOR, 61st Sess, Supp No 49, UN Doc A/RES/61/295 (13 September 2007).

¹³⁹ UNDRIP arts 25, 26 and 32.

UNDRIP therefore represents a significant advancement in recognitional justice by framing Indigenous peoples as rights holders with collective relationships to territory. However, because it is not legally binding, its ability to constrain state decision-making and accountability mechanisms remains limited.¹⁴⁰

4.2.2 International Labour Organization Convention No.169 (ILO 169)

The most significant, legally binding international framework governing Indigenous rights is the International Labour Organization Convention No.169 on Indigenous and Tribal Peoples (1989), which Chile ratified in 2008.¹⁴¹

ILO 169 recognises Indigenous peoples' cultural, social and spiritual relationships with the lands and territories they traditionally occupy or use. Articles 13-19 require states to respect and safeguard these relationships, while Article 6 establishes a duty to consult Indigenous peoples through appropriate representative institutions whenever legislative or administrative measures may directly affect them.¹⁴²

Consultations must be undertaken in good faith and with the objective of achieving agreement or consent.¹⁴³ However, importantly, the Convention establishes a requirement of consultation rather than a general right to veto extractive projects. This distinction creates an important legal limitation which is examined later in relation to procedural justice.¹⁴⁴

4.3 Regional Environmental Governance

4.3.1 The Escazú Agreement

In 2022, Chile ratified the Regional Agreement on Access to Information, Public Participation and Access to Justice in Environmental Matters in Latin America and the Caribbean, otherwise known as the Escazú Agreement.¹⁴⁵ Escazú establishes obligations relating to environmental data, public participation, access to justice and protection of defenders of human rights with respect to the environment.¹⁴⁶

¹⁴⁰ UNDRIP (n 1).

¹⁴¹ Indigenous and Tribal Peoples Convention (No 169) (adopted 27 June 1989, entered into force 5 September 1991) 1650 UNTS 383.

¹⁴² ILO Convention No 169 arts 6, 13–19.

¹⁴³ ILO Convention No 169 art 6.

¹⁴⁴ International Federation for Human Rights, Chile: Indigenous Peoples, Lithium Extraction and Human Rights in the Salar de Atacama (2024) 108–109.

¹⁴⁵ Regional Agreement on Access to Information, Public Participation and Justice in Environmental Matters in Latin America and the Caribbean (adopted 4 March 2018, entered into force 22 April 2021).

¹⁴⁶ Escazú Agreement arts 5–9.

The agreement represents a shift towards environmental democracy, strengthening procedural rights and promoting greater equality in access to environmental decision-making processes. In the context of lithium extraction, these provisions are particularly relevant because access to reliable environmental information and meaningful participation are essential for communities attempting to evaluate and challenge extractive projects.

However, implementation challenges remain. A recent report by FIMA (Fiscalia del Medio Ambiente, a Chilean NGO) identified gaps between Escazú's requirements and Chilean practice, including barriers faced by vulnerable groups in accessing information and limited protection mechanisms for environmental human rights defenders.¹⁴⁷

4.4 Domestic Environmental Governance

4.4.1 Law No. 19.300 on the General Bases of the Environment (1994)

Law No. 19.300 on the General Bases of the Environment forms the cornerstone of Chile's environmental governance framework.¹⁴⁸ It established the Environmental Impact Assessment System (Sistema de Evaluación de Impacto Ambiental - SEIA), through which major extractive projects, including lithium operations, must undergo environmental review before approval.¹⁴⁹ The detailed operation of SEIA is governed by the Regulation of the Environmental Impact Assessment System (Supreme Decree No. 40/2012), which specifies the procedures for environmental assessment, public participation and project evaluation.¹⁵⁰ SEIA requires projects to assess not only environmental impacts, such as effects on water resources, biodiversity and ecosystems, but also relevant social and cultural impacts, particularly where Indigenous communities may be affected.¹⁵¹ Companies must identify potential environmental and social impacts, propose mitigation, compensation and monitoring measures, and comply with the legally binding conditions contained within their Environmental Qualification Resolution (Resolución de Calificación Ambiental - RCA).¹⁵² While Law 19.300 strengthened environmental oversight and public participation, it remains a mechanism for regulating extraction rather than determining whether extraction should proceed, with final decision-making authority remaining with the state.

¹⁴⁷ David R Boyd, Visit to Chile: Report of the Special Rapporteur on the Human Right to a Clean, Healthy and Sustainable Environment UN Doc A/HRC/55/43/Add.1 (2024).

¹⁴⁸ Law No 19.300 on General Bases of the Environment (Chile, 1994).

¹⁴⁹ *Ibid.*

¹⁵⁰ Ministry of the Environment (Chile), Regulation of the Environmental Impact Assessment System (Supreme Decree No 40, 2012).

¹⁵¹ Ministry of the Environment (Chile), Regulation of the Environmental Impact Assessment System (Supreme Decree No 40, 2012).

¹⁵² *Ibid.*

Chapter 5 - Case Study - Lithium Mining in the Salar de Atacama

5.1 Overview of the Salar de Atacama Ecosystem and Extraction

Chile is one of the largest lithium producers in the world and is part of the Lithium Triangle, between Salar de Atacama in Chile, Salar del Hombre Muerto in Argentina and Salar de Uyuni in Bolivia.¹⁵³ These three salt flats (salares) contain some of the world's lithium brine resources,¹⁵⁴ with the Atacama producing 70% of the world's lithium produced from brines making it the largest and most productive lithium brine operation in the world.¹⁵⁵

The Atacama is the world's driest desert and yet, despite this, is home to an unique hydrologically connected wetland ecosystem.¹⁵⁶ The Salar de Atacama is much more than a deposit of salt and minerals, it is a combination of underground freshwater aquifers, saline groundwater, brines, springs, marshes, shallow lagoons and salt crusts. With its exceptionally lithium-rich brines and combination of other climatic, geological, geothermal and hydrological conditions, it is one of the most cost-effective places to mine lithium in the world,¹⁵⁷ ecologically and economically valuable and at the same time fragile.

The Salar basin is fed by river runoff and snowmelt from the surrounding mountains as well as rainfall and groundwater.¹⁵⁸ As the water moves through volcanic rock on its way to the basin it dissolves minerals such as lithium.¹⁵⁹ On reaching the basin, the water only has two ways to leave, through evaporation or the relatively minor process of seeping.¹⁶⁰ As the water cannot flow out, the minerals are increasingly concentrated as water evaporates and minerals are left behind.¹⁶¹ This, along with the combination of factors, notably, the absence of contaminants, the high evaporation rate due to high solar radiation, low levels of rainfall, and aridity makes it extremely economically valuable as it contains more than 90% of Chile's lithium reserves.¹⁶² It also makes it extremely hydrogeologically vulnerable. In addition, the Salar suffers an increasing water deficit as the outflow exceeds the recharge capacity.¹⁶³

¹⁵³ Government of Chile (n135)

¹⁵⁴ José Cabello, 'Lithium Brine Production, Reserves, Resources and Exploration in Chile: An Updated Review' (2021) 145 *Ore Geology Reviews* 104803.

¹⁵⁵ M Álvarez and others, 'Lithium in Chile: Present Status and Future Outlook' (2024) *Materials Advances*.

¹⁵⁶ Mauricio Lorca and others, 'Mining Indigenous Territories: Consensus, Tensions and Ambivalences in the Salar de Atacama' (2022) 9 *The Extractive Industries and Society* 101047.

¹⁵⁷ Riofrancos, (n46) 38.

¹⁵⁸ Mirko van Pampus and others, 'Uncertainties in the Debate on the Environmental Impact of Lithium Brine Extraction in the Salar de Atacama, Chile' (2023) 1 *Evolving Earth* 100024.

¹⁵⁹ *Ibid.*

¹⁶⁰ *Ibid.*

¹⁶¹ Lorca others (n156)

¹⁶² Government of Chile (n153)

¹⁶³ van Pampus and others (n 166).

The most significant effect is at the “mixing zone”, the eastern peripheries of the basin where the Andean mountains provide rain and snow runoff.¹⁶⁴ This source of fresh water to the saline groundwater combines to form the ideal mix for wetlands and playa lakes (a closed hydrological system) to form. This in turn has provided the ideal conditions to “sustain a rich biodiversity, including guanacos, vicuñas and llamas, three types of flamingos, migratory (water) birds, lizards, bats, foxes, various types of rodents and the ostrich-like rhea, some which are unique to this ecosystem”.¹⁶⁵

Not only are microorganisms, flora and fauna reliant on this oasis but so are The Atacameño or Lickanantay people, the indigenous communities that reside in their ancestral territory in and around the Salar de Atacama basin.¹⁶⁶ These communities have lived within and adapted to the hyper-arid conditions over many generations and have built their livelihoods and cultural practices around scarce water systems, including agricultural oases and high-altitude wetlands. The water reserves in the Atacama are vital for the survival of these communities.¹⁶⁷ Anthropological research has confirmed that Atacameño relationships with their territory are deeply socially, culturally, and politically complex and rooted in their landscapes and water.¹⁶⁸

Despite the desert’s harsh conditions, this combination of factors allows for a plethora of life to exist in the Salar de Atacama. However, due to rising temperatures associated with climate change, growing tourism and extensive mining, the water is being removed faster than it is being “recharged” leading to droughts and environmental degradation.¹⁶⁹ Lithium bearing brine (mineral-rich groundwater) is pumped up and collected in pools where the water is evaporated off under the desert sun over a period of months to leave concentrated lithium behind. This is highly controversial in already drought prone areas but it may also alter the delicate balance of conditions that make the wetlands an ideal site for ecosystems to thrive.¹⁷⁰ Lithium extraction has therefore spurred debate as to its environmental impacts as well as Indigenous rights and participation.¹⁷¹

The remainder of this chapter examines how Chile has sought to govern lithium extraction within the Salar de Atacama. It first considers the governance arrangements through which the state seeks to capture economic value from lithium production before examining the environmental monitoring, regulatory and compliance mechanisms intended to safeguard the Salar's ecosystems and the rights of Indigenous communities.

¹⁶⁴ *Ibid.*

¹⁶⁵ van Pampus and others (n 166) 3.

¹⁶⁶ Government of Chile (n153).

¹⁶⁷ *Ibid.*

¹⁶⁸ Lorca and others (n156).

¹⁶⁹ *Ibid.*

¹⁷⁰ van Pampus and others (n 166).

¹⁷¹ Lorca and others (n156)

5.2 Resource Governance: From Neoliberal Status Quo to State–Private Contractual Extraction Regime (CORFO Governance Model)

Chile's lithium governance has historically been shaped by a neoliberal model of mineral development. Following the market-oriented reforms implemented during the Pinochet dictatorship (1973–1990), Chile's broader mining sector became characterised by export-led growth, liberal investment frameworks, and integration into global commodity markets.¹⁷² These reforms fundamentally restructured the relationship between the state and the mining sector, reducing direct state participation in production while encouraging private and foreign investment. Although lithium remained legally distinct from most other minerals, its commercial development took place within this broader neoliberal political economy.¹⁷³

Lithium constitutes an important exception to Chile's otherwise liberal mining regime, requiring special contracts through which the state retained significant control. Most critical minerals in Chile are governed under the conventional mining concession system whereby a company can obtain a concession through the court, however lithium is an exception.¹⁷⁴ In 1979, Decree Law No. 2886 classified lithium as a strategic, non-concessionable mineral reserved to the State. This meant that specialised authorisation must be obtained through a Special Lithium Operation Contract (CEOL) or other contractual arrangements administered by the Chilean State. In the Salar de Atacama these agreements are managed by CORFO (Corporación de Fomento de la Producción - The Chilean Development Agency).¹⁷⁵ Extraction and export still happen through private partnerships but the state retains control over which companies are permitted to extract and under what conditions.¹⁷⁶

The 1983 Mining Code preserved the existing legal position whereby lithium was a non-concessionable mineral, while protecting mining rights that had been acquired before the restriction entered into force. These grandfathered rights enabled certain companies to continue extracting lithium through special contractual arrangements with the Chilean State.¹⁷⁷

As a result of this historical and legal framework, commercial lithium production in the Salar de Atacama has remained concentrated in two companies, Sociedad Química y Minera de Chile (SQM) and Albemarle which operate through agreements with the state and CORFO rather than conventional mining concessions.¹⁷⁸ Albemarle is a North American company and therefore a foreign investor.¹⁷⁹ SQM, although a Chilean company, is not a state-owned enterprise. It was

¹⁷² Thea Riofrancos, *Extraction: The Frontiers of Green Capitalism* (Allen Lane 2025) ch 1.

¹⁷³ Thea Riofrancos (n49)

¹⁷⁴ Government of Chile (n153)

¹⁷⁵ *Ibid.*

¹⁷⁶ Riofrancos (n49)

¹⁷⁷ Government of Chile (n135 8–10; Riofrancos, (n209) ch 2.

¹⁷⁸ Riofrancos (n49)

¹⁷⁹ Albemarle Corporation, Annual Report 2024.

initially founded as state -owned in 1968 but was privatised in the 1980s during the dictatorship.¹⁸⁰ Although Chile based, SQM is now a privately owned multinational corporation whose largest shareholders include Tianqi Lithium alongside institutional investors.¹⁸¹ Albemarle's contract is due to expire in 2043, with the government indicating that future production will continue under state-led contractual arrangements.¹⁸² In 2030 SQM's current contract will terminate and the Codelco–SQM partnership (the state-private agreement) will take its place.¹⁸³ In practice, this model has produced a dual structure in which firms operate as primary extractive actors, while the state captures economic value through royalties, lease payments, taxes and contractual revenue-sharing mechanisms.¹⁸⁴ These long-term contracts embedded lithium extraction within a legal and institutional framework designed to encourage private investment by reducing regulatory uncertainty, while enabling the state to specify production quotas, fiscal terms and environmental obligations.¹⁸⁵ This model enabled Chile to become one of the world's leading lithium producers and the world's largest producer of lithium from brines, while generating significant export revenues.¹⁸⁶ However successive governments have continued to rely upon the SQM-Albemarle duopoly and have not had the capacity to monitor or regulate the sector sufficiently.¹⁸⁷ These tensions gradually prompted calls for greater state participation in lithium governance, laying the foundations for the reforms that followed.¹⁸⁸

5.3 Private Actors Non-Compliance, Corruption and Regulatory Enforcement

Both companies have a history of exploitative practices and what can be considered manipulative or evasive behaviour in terms of their commitments to social and economical responsibility. In 2014 CORFO opened arbitration against SMQ for underpaying lease rents, breaching lease agreements and withholding information and later in 2016 filed legal action seeking early termination of their contract.¹⁸⁹ Albemarle has also been involved in contractual disputes with CORFO concerning the interpretation and payment of royalties under its lease agreement, although it has been subject to substantially fewer legal proceedings than SQM.¹⁹⁰ Additionally,

¹⁸⁰ Riofrancos, (n209)

¹⁸¹ SQM, Annual Report 2020 116–118 (shareholder structure).

¹⁸² Government of Chile (n135)

¹⁸³ Codelco, 'Codelco and SQM sign partnership agreement to develop lithium in the Salar de Atacama' (31 May 2024).

¹⁸⁴ Government of Chile (n135); Riofrancos, (n49) ch 2.

¹⁸⁵ Ana Elizabeth Bastida, 'Redesigning Mineral Regimes to Strengthen the Environmental Rule of Law: A Case Study on Lithium in Brines' (2024) 33 *Review of European, Comparative & International Environmental Law* 633, 640–643.

¹⁸⁶ Government of Chile (153)

¹⁸⁷ Riofrancos (n49)

¹⁸⁸ Comisión Nacional del Litio, Informe Final (Ministerio de Minería 2015) 19–34.

¹⁸⁹ Sociedad Química y Minera de Chile SA, Annual Report 2014 (2015) 117–119; CORFO, 'Corfo inicia nuevo proceso contra SQM Salar por incumplimiento de Contrato de Proyecto'

¹⁹⁰ Corporación de Fomento de la Producción (CORFO) and Albemarle Corporation, 'Albemarle and CORFO Announce Resolution in Chile' (24 January 2019) <https://www.prnewswire.com/news-releases/albemarle-and-corfo-announce-resolution-in-chile-300784005.html> accessed 23 July 2026.

in 2015 it was made public that SQM had been lobbying the government through illegal political contributions, through fake invoices as part of a broader scheme to cultivate political influence and favourable relations with state officials.¹⁹¹ This seriously damaged the company's reputation and the trust that non-complicit state actors and the public had in the company and in the wider state-company relationship. The scandal exposed the extent to which private actors could shape state decision-making, raising broader concerns about regulatory independence and accountability in Chile's lithium governance.

Regulatory Enforcement

Chile's environmental governance framework extends beyond legislation to include institutions responsible for monitoring compliance, enforcing environmental obligations and adjudicating disputes. The following regulatory actions and legal proceedings demonstrate how these institutions, including the Superintendence of the Environment (SMA), the Environmental Courts and the Supreme Court, have been used to oversee lithium extraction and provide avenues through which environmental and Indigenous rights claims can be pursued.

Sanctions

In 2016 the Superintendencia del Medio Ambiente (SMA - Superintendence of the Environment) opened sanctioning proceedings against SQM Salar for alleged environmental violations, including over-extraction, inadequate environmental monitoring, submitting incomplete information and non-compliance with environmental conditions stipulated in the environmental approval.¹⁹² SQM subsequently proposed a compliance programme valued at approximately US\$25 million.¹⁹³ Although the SMA approved the programme in 2019, the First Environmental Court later annulled that approval, finding deficiencies in the regulator's assessment and requiring the sanctioning process to resume. Proceedings therefore remain ongoing.

¹⁹¹ Riofrancos (n209)

¹⁹² Superintendencia del Medio Ambiente, Resolution Rol F-041-2016 (2016); SQM, Annual Report 2017 161–162; SQM, Sustainability Report 2019 230–231.

¹⁹³ Reuters, 'Chile regulator charged SQM with overdrawing lithium-rich brine...' reproduced in Inter-American Development Bank, Environmental, Health, Safety and Social Management of Green Hydrogen in Latin America and the Caribbean (2023)

In 2016 and 2017, Dirección General De Aguas (DGA - Chile's water regulator) declared the San Pedro and Vilama River basins exhausted,¹⁹⁴¹⁹⁵ and in 2018 prohibited the granting of new groundwater extraction rights within the Salar de Atacama basin.¹⁹⁶

In 2022, the SMA opened a sanctioning procedure against Albemarle for alleged over-extraction and failure to comply with an Early Warning Plan and failure to reduce extraction when warning thresholds had been exceeded.¹⁹⁷ The proceedings remain ongoing.

Domestic Lawsuits

Camar Indigenous Community vs CORFO (2018 - 2022)

This lawsuit was particularly significant as the community took the state to the Supreme Court over claims that the formula CORFO uses to distribute SQM's community contributions among the eligible Atacameño communities was unfair.¹⁹⁸ In 2018 The Camar community filed a constitutional protection action claiming that CORFO's approved formula splits 50% of the funds equally across all communities, regardless of their proximity to or impact from the mining operations, that it did not take into account which communities were more affected and did not meet prior consultation requirements of the ILO 169.¹⁹⁹ The Supreme Court left this pending until 2022 at which time it ruled in favour of the Camar Indigenous Communities,²⁰⁰ that CORFO must carry out a formal Indigenous consultation process specifically regarding how the SQM-derived contributions are allocated among communities.²⁰¹ However, all contributions from 2021 were frozen pending completion of that court-ordered consultation which were concluded in 2024, unfreezing the contributions.

Peine and Camar Indigenous Communities vs SQM 2019

¹⁹⁴ Dirección General de Aguas, Resolución DGA N° 44, de 13 de mayo de 2016, que declara el agotamiento de la cuenca del Río San Pedro y sus afluentes, Provincia de El Loa, Región de Antofagasta. Available via the DGA's official register. DGA – Declaración de agotamiento

¹⁹⁵ Dirección General de Aguas, Resolución DGA N° 3, de 12 de abril de 2017, que declara el agotamiento de la cuenca del Río Vilama y sus afluentes, Provincia de El Loa, Región de Antofagasta.

¹⁹⁶ Dirección General de Aguas, Zona de prohibición para nuevas explotaciones de aguas subterráneas. DGA – Zonas de prohibición

¹⁹⁷ Superintendencia del Medio Ambiente, 'Procedimiento Sancionatorio Rol F-018-2022: Albemarle Limitada' (Expediente SNIFA, initiated 9 March 2022).

¹⁹⁸ Comunidad Indígena Atacameña de Camar con Corporación de Fomento de la Producción (CORFO), Corte Suprema de Chile, Rol No 14.514-2021 (18 May 2022).

¹⁹⁹ *ibid*; Corporación de Fomento de la Producción (CORFO), Consulta Indígena sobre el mecanismo de distribución de aportes del Convenio CORFO–SQM Salar (2024).

²⁰⁰ Corte Suprema de Chile, Comunidad Indígena Atacameña de Camar con Corporación de Fomento de la Producción (CORFO), Rol No 14.514-2021 (judgment of 18 May 2022).

²⁰¹ Corporación de Fomento de la Producción (CORFO), (n199)

In 2019 the Peine and Camar Indigenous Communities and the Indigenous Advisory Council of the Atacameño People challenged the SMA's approval of SQM's compliance programme before the First Environmental Court of Antofagasta. The applicants argued that SQM's excessive extraction of lithium-rich brine was disrupting the ecological balance of the Salar de Atacama and threatening the wetlands, lagoons and water-dependent practices of the surrounding Indigenous communities.²⁰²

The court found that SQM's proposed compliance programme was insufficient because it failed to demonstrate that the proposed measures could prevent, reduce or eliminate the environmental harm arising from the alleged breaches. The court said its decision was based on a “precautionary principle”, emphasising the “particular fragility” of the Atacama ecosystem and the “high level of scientific uncertainty” surrounding the hydrological behaviour of the Salar de Atacama. The Court therefore annulled the SMA's approval of the compliance programme and required the regulator to resume the sanctioning proceedings against SQM.²⁰³

Consejo de Defensa del Estado (CDE) & Peine Community vs Albemarle, Minera Escondida and Zaldívar 2022 - 2024)

In 2022, the Consejo de Defensa del Estado (CDE - Chile's State Defence Council) filed an environmental damage action before the First Environmental Court of Antofagasta against Albemarle, BHP's Minera Escondida and Antofagasta Minerals' Minera Zaldívar.²⁰⁴ The CDE alleged that the defendants had caused serious environmental damage to the Tilopozo aquifer, adversely affecting local flora and the traditional life systems and customs of the Peine Indigenous Community. Rather than seeking financial compensation, the action sought restoration of the damaged ecosystem. In 2024, the parties reached a judicial settlement requiring restoration of the affected hydrological system, environmental remediation and compensation measures for the Peine Community.²⁰⁵

5.4 Hybrid Resource Nationalism: Chile's National Lithium Strategy and Contractual Reforms

²⁰² First Environmental Court of Antofagasta, Complaints R-17-2019, R-18-2019 and R-19-2019 (judgment, 26 December 2019); Reuters, 'Chile lithium miner SQM dealt blow by environmental court ruling' Al Jazeera (27 December 2019).

²⁰³ *Ibid.*

²⁰⁴ First Environmental Court of Antofagasta, Consejo de Defensa del Estado v Albemarle Ltda, Minera Escondida Ltda and Compañía Minera Zaldívar SpA (settlement approved 2024); Dmitry Akchurin, 'Environmental Justice at the Environmental Courts? Mining, Socioenvironmental Conflicts, and Environmental Litigation in Northern Chile' (2023).

²⁰⁵ Primer Tribunal Ambiental de Antofagasta, Consejo de Defensa del Estado con Albemarle Ltda, Minera Escondida Ltda y Compañía Minera Zaldívar SpA, settlement approving agreement (2024); Thea Riofrancos, (n209)ch4.

Chile's shift towards greater state participation in lithium governance did not occur through a single political administration or policy. Rather, it evolved over more than a decade through successive governments, which responded to mounting environmental conflict, contractual disputes with lithium producers, public criticism of the existing governance model and growing recognition of lithium's strategic importance for the global energy transition. Rather than pursuing outright nationalisation, these reforms progressively increased state control while maintaining private investment.²⁰⁶

National Lithium Commission (2014)

Public pressure surrounding lithium governance led the then centre-left government to establish the National Lithium Commission in 2014. The Commission brought together representatives from the public and private sectors, international experts and, notably, Indigenous communities, and was tasked with reviewing the governance of lithium extraction in the Salar de Atacama.²⁰⁷

The Commission concluded that, although lithium extraction generated ecological harms and economic inequalities, it also presented significant opportunities for national development. It recommended a governance model in which foreign mining companies would make substantially greater financial contributions to the Chilean state, while those revenues would be invested in technological innovation and the development of domestic value-added industries beyond raw mineral extraction. One of its principal recommendations was the creation of a National Lithium Company to increase direct state participation in the sector, although this has not yet been established.²⁰⁸

Contractual Renegotiations (2016–2018)

Following contractual disputes initiated by CORFO against Albemarle and SQM, the companies renegotiated their exploitation agreements in 2016 and 2018 respectively. The revised agreements replaced the previous fixed lease payment system with a progressive price-linked commission structure tied to international lithium prices, substantially increasing the financial returns payable to the Chilean State. Under the renegotiated contracts, payment rates increased progressively as lithium prices rose, reaching over 40% when prices exceeded specified thresholds. The new arrangements have been described by commentators as among the most demanding fiscal regimes for lithium production globally.²⁰⁹

²⁰⁶ Riofrancos (n49)

²⁰⁷ Comisión Nacional del Litio, Informe Comisión Nacional del Litio (Ministerio de Minería 2015); Decreto Supremo No 60, Ministerio de Minería (2014)

²⁰⁸ Comisión Nacional del Litio, Informe Comisión Nacional del Litio (Ministerio de Minería 2015)

²⁰⁹ Thea Riofrancos, *Extraction: The Frontiers of Green Capitalism* (Allen Lane 2025) ch 4; Nicolás M Perrone and Lorenzo Cotula, 'The Governance of Lithium in Chile' (2022) 25 *Journal of International Economic Law* 148–170

For SQM, lease payments increased from approximately 5.8% of gross income before negotiation to a progressive royalty linked to international lithium prices, rising to a marginal rate of 40% at higher price thresholds. Albemarle's 2016 agreement similarly replaced its previous fixed payment structure with a progressive royalty ranging from 6.8% at lower lithium prices to a 40% marginal rate above US\$10,000 per tonne of lithium carbonate.²¹⁰

The agreements also introduced a range of additional obligations beyond fiscal contributions. Environmental monitoring and reporting requirements were strengthened, both companies were required to allocate a proportion of their lithium production to domestic value-added industries at preferential prices, including discounts of up to 25%, and annual contributions of between US\$12 million and US\$15 million were established to support research and development in lithium technologies, salt-flat ecosystems and clean energy innovation. The agreements further required both companies to make financial contributions to local and Indigenous communities through benefit-sharing arrangements (see benefit-sharing below).²¹¹ Collectively, these reforms marked a significant departure from the earlier contractual model by strengthening the state's fiscal, regulatory and developmental role without fundamentally altering the public-private structure of lithium production.²¹²

National Lithium Strategy (2023)

Building upon reforms initiated by previous administrations, the Boric Administration announced the National Lithium Strategy in 2023. Rather than representing a complete break with Chile's existing governance model, the Strategy consolidated an ongoing shift towards greater state participation in lithium governance while maintaining private investment.²¹³ It also proposed the development of domestic value-added industries as a central policy objective, moving beyond an economic model based primarily on raw mineral exports by expanding downstream processing and manufacturing within Chile.²¹⁴

Rather than pursuing outright nationalisation, the Strategy proposed a hybrid public-private partnership model in which state-owned enterprises, particularly Codelco, would acquire ownership stakes in future lithium projects. It also reaffirmed the government's intention to establish a National Lithium Company and envisaged greater state participation throughout the

²¹⁰ Nicolás M Perrone and Lorenzo Cotula, 'The Governance of Lithium in Chile' (2022) 25 *Journal of International Economic Law* 148–170; CORFO, Contrato de Arrendamiento Proyecto Salar de Atacama (SQM, amended 2018); CORFO, Contrato Especial de Operación del Litio (Albemarle, amended 2016)

²¹¹ CORFO, Contrato de Arrendamiento Proyecto Salar de Atacama (SQM, amended 2018); CORFO, Contrato Especial de Operación del Litio (Albemarle, amended 2016); Thea Riofrancos (n209) ch 4.

²¹² Riofrancos (n49).

²¹³ Gobierno de Chile, Estrategia Nacional del Litio (2023); Riofrancos (n49).

²¹⁴ Government of Chile, (n 5).

lithium value chain, including through the planned partnership between SQM and Codelco from 2030 onwards.²¹⁵

The Strategy also recognises that Chile's salt flats constitute complex and unique ecosystems, important water reserves and the ancestral territories of Indigenous Peoples. It identifies environmental protection, public participation, Indigenous engagement and territorial development as guiding principles for future lithium governance, while emphasising the importance of protecting salt-flat ecosystems and their associated water resources.²¹⁶

Although the National Lithium Strategy represents the most ambitious attempt to date to increase state participation in lithium governance, the future direction of Chile's lithium policy remains uncertain. President Kast has announced his intention to review elements of the National Lithium Strategy, including proposals to expand private sector participation and reorganise ministerial responsibilities affecting mining governance.²¹⁷

5.5 Environmental Impacts: Water vs Brine, Environmental Impact Assessments and Ecosystem Degradation

The Salar de Atacama as a Fragile Hydrological Ecosystem

Due to the particular hyper-aridity of the Salar de Atacama, the local life forms are particularly adapted and specialised to the extreme water scarcity.²¹⁸ This has resulted in minimal resilience to sudden environmental shocks or alterations in ecosystem conditions.²¹⁹ Recharge rates of water are slow and episodic, spanning thousands of years, so the fragile ecosystems and biodiversity depend on stable groundwater conditions.²²⁰ Unlike many mining regions, the principal environmental controversy in the Salar de Atacama is not simply the quantity of freshwater extracted, but the uncertainty surrounding the relationship between freshwater, subterranean brine systems and the wider salt-flat ecosystem.²²¹

²¹⁵ Government of Chile, (n)5; Codelco and SQM, Memorandum of Understanding (2023)

²¹⁶ *Ibid.*

²¹⁷ Reuters, 'Chile wants 3 or 4 new lithium projects running in 2026, finance minister says' (2 March 2024)

²¹⁸ Lorca and others (n156)

²¹⁹ Lorca and others (n156) 2.

²²⁰ Naomi Moran and others, 'Lithium in Hot Water: The Resource, the Extraction and the Sustainability of Salt Flat Brines' (2021) 22 *Geochemistry, Geophysics, Geosystems* e2020GC009345; Miguel Ángel Marazuela, Enric Vázquez-Suñé, Carlos Ayora and Alejandro García-Gil, 'Towards More Sustainable Brine Extraction in Salt Flats: Learning from the Salar de Atacama' (2020) 703 *Science of the Total Environment* 135605, 4.

²²¹ María L Vera and others, 'Environmental Impact of Direct Lithium Extraction from Brines' (2023) 4 *Nature Reviews Earth & Environment* 149, 151–158; Miguel Ángel Marazuela, Enric Vázquez-Suñé, Carlos Ayora and Alejandro García-Gil, 'Towards More Sustainable Brine Extraction in Salt Flats: Learning from the Salar de Atacama' (2020) 703 *Science of the Total Environment* 135605, 2.

Brine has been found to be extremely important to the stabilisation of the Salar de Atacama ecosystem.²²² Brine, the groundwater beneath the salt crust, and the freshwater that flows from the Andes combine to create the hydraulically interconnected "mixing zones" or salares (saline lakes) that support wetlands and lagoons across the Salar de Atacama.²²³ Saline lakes represent a striking example of the trade-offs initiated by the development of green technologies. Despite making up a small proportion of wetlands, saline lakes support globally important aquatic species, while extractivism potentially threatens more than twenty saline lakes across the region.²²⁴ These salars are not only biodiverse but also provide considerable economic, cultural and health-related benefits for local communities.²²⁵

The ecosystem of the Salar de Atacama and the extreme conditions on the salt flats may also provide insights into the earliest stages of evolution on Earth.²²⁶ Currently, only 7.5% of Chile's salt-flat area is protected under existing conservation measures, although the National Lithium Strategy aims to increase this to 30% by 2030.²²⁷

²²² Marazuela and others (n56) 4–7.

²²³ Vera and others (n45) 152–155; Marazuela and others (n34) 4.

²²⁴ Vera and others (n 45) 149.

²²⁵ *Ibid.*

²²⁶ Marieke, Pampus and others, 'Evolving Earth: Lithium Mining in the Salar de Atacama' (2023) 1 *Evolving Earth* 100024, 3.

²²⁷ Gobierno de Chile, *Estrategia Nacional del Litio* (Gobierno de Chile 2023) 34.

Issue	Importance in Salar de Atacama	Comments	
Water depletion	★★★★★	The central environmental issue. Brine extraction affects groundwater systems and freshwater availability, although the extent and mechanisms remain scientifically debated.	
Ecosystem degradation	★★★★★	Impacts on salt flat hydrology, wetlands (<i>bofedales</i>), lagoons, biodiversity, and species such as flamingos are major concerns.	
Indigenous community conflict	★★★★★	One of the defining governance issues. Debates centre on consultation, consent, territorial rights, and benefit sharing with Atacameño (Lickanantay) communities.	
Governance failures	★★★★☆	Frequently discussed in relation to fragmented regulation, uncertainty over hydrological impacts, transparency, and balancing national economic goals with local concerns.	
Human rights	★★★★☆	Mainly framed through Indigenous rights, participation, Free, Prior and Informed Consent (FPIC), cultural rights, and access to water rather than severe physical abuses.	
Community displacement	★★☆☆☆	There is little evidence of large-scale forced relocation compared with many open-pit mining projects, although changes to livelihoods and access to traditional territories are important.	
Unsafe working conditions	★★☆☆☆	Not a major focus in the Salar de Atacama literature. Chile has comparatively stronger labour regulation than many major mining jurisdictions.	
Child labour	☆☆☆☆☆	Essentially not an issue in the Chilean lithium sector. This concern is much more closely associated with artisanal cobalt mining in the DRC.	

*This chart demonstrated which socioecological issues are more pressing in the Salar de Atacama. N.b. Produced by ChatGPT after reviewing relevant literature and data.

Water Governance and the Freshwater-Brine Distinction

The environmental impacts of lithium mining in Chile are therefore concentrated around water depletion and ecosystem degradation.²²⁸ Lithium extraction in the region is structurally

²²⁸ María L Vera and others, 'Environmental Impact of Direct Lithium Extraction from Brines' (2023) 4 Nature Reviews Earth & Environment 149.

dependent on water governance regimes that regulate access to both freshwater and subterranean brine systems.²²⁹

Water in Chile is governed by the 1981 Código de Aguas (Water Code), an outdated regulatory framework inherited from the Pinochet era that privatised water rights.²³⁰ The state over-granted water rights to corporations, resulting in companies holding more legal rights to water than citizens.²³¹

Mining companies in the area have rights to use approximately 10% of available freshwater, equating to around 240 litres per second, whereas residents have rights to just 2%.²³² Although mining represents a relatively small proportion of Chile's national water consumption, water demand is concentrated in the water-scarce Antofagasta Region, where competition over limited freshwater resources is particularly acute.²³³

However, it should be pointed out that it is not two million litres of freshwater that are evaporated, it is lithium-rich brine.²³⁴ This distinction matters because mining companies argue that they pump saline groundwater rather than freshwater.²³⁵ However, environmental justice scholars argue that extracting and evaporating brine can still alter the hydrological balance of the salar, potentially reducing connected freshwater resources, wetlands and lagoons that sustain Indigenous communities and biodiversity.²³⁶

The ambiguous legal classification of brine further complicates this debate. Brine is geochemically distinct from freshwater resources but functions ecologically as part of the same hydrological system.²³⁷ Under Chilean law, "water" refers to freshwater suitable for human use, whereas brine, approximately ten times saltier than seawater, is regulated as a mineral resource under the Chilean Mining Code (1983) rather than as part of the water ecosystem.²³⁸

²²⁹ Barbara Jerez, Ingrid Garcés and Robinson Torres, 'Lithium Extractivism and Water Injustices in the Salar de Atacama, Chile: The Colonial Shadow of Green Electromobility' (2021) 87 *Political Geography* 102382, 3.

²³⁰ Código de Aguas (Chile) 1981; Jerez and others (n56) 3.

²³¹ Jerez and others (n34) 3; United Nations Human Rights Council, Visit to Chile: Report of the Special Rapporteur on the Issue of Human Rights Obligations Relating to the Enjoyment of a Safe, Clean, Healthy and Sustainable Environment, David R Boyd, UN Doc A/HRC/55/43/Add.1 (3 January 2024) para [7].

²³² Riofrancos (n) ch 4.

²³³ Organisation for Economic Co-operation and Development (OECD), OECD Environmental Performance Reviews: Chile 2024 (OECD Publishing 2024) ch 2 ('Water Management and Policies').

²³⁴ Vera and others (n12) 149.

²³⁵ Mirko van Pampus and others, 'Uncertainties in the Debate on the Environmental Impact of Lithium Brine Extraction in the Salar de Atacama, Chile' (2023) 1 *Evolving Earth* 100024.

²³⁶ Vera and others (n 12) 149.

²³⁷ Moran and others (n35); Vera and others (n 56) 149.

²³⁸ Código de Aguas (Chile) 1981; Jerez and others (n78) 3.

Consequently, brine extraction is regulated separately through CORFO agreements, which currently permit extraction of up to 1,600 litres per second.²³⁹

Scientific Uncertainty and Ecosystem Degradation

Brine extraction quotas are based upon hydrogeological modelling because it is impossible to directly measure ecosystem responses in advance of extraction.²⁴⁰ However, there has been considerable criticism of this scientific and regulatory gap, as uncertainty remains regarding how much extraction the ecosystem can tolerate, where ecological tipping points lie, and the long-term effects of altering the hydrological balance.²⁴¹ As Vera and colleagues observes, reliable hydrogeological modelling requires detailed knowledge of the number, distribution and depth of both freshwater and brine wells. Because each salar possesses distinct hydrogeological characteristics, findings from one salt flat cannot simply be extrapolated to another.²⁴²

Lorca's fieldwork, based on interviews with Indigenous and local community members living in the Atacama region, provides first-hand accounts of the environmental changes experienced by those living alongside lithium extraction.²⁴³ Interviewees consistently expressed concern about water scarcity and increasing signs of environmental deterioration, including declining bodies of water, changing landscapes, soil salinisation, disappearing local fauna and altered bird migration patterns.²⁴⁴

[...] with the extraction of thousands of liters of water in the desert, if it doesn't rain, there is no water recharge, there is chaos and the animals, the guanacos, began to abort; and if they gave birth, they abandoned their offspring because there was no food, no water. Nobody talks about this because here we have big transnational companies and everything is beautiful. But those of us who live here know what is happening.²⁴⁵

The lived experience of people in the territory contrasts with other scientific studies. Guzmán et al. (2022), for example, analysed satellite imagery of major lagoon systems between 1986 and 2018 and found that lagoon surface areas remained relatively stable, with no statistically significant relationship between brine extraction and lagoon surface area decline over that period.²⁴⁶ While this challenges the simplified claim that lithium extraction has already dried out

²³⁹ Riofrancos (n 78) ch 4.

²⁴⁰ Marazuela and others (n 45) 670.

²⁴¹ *Ibid* 679; Vera and others (n56x) 158.

²⁴² Vera and others (n56) 152

²⁴³ Lorca and others (n156) 6

²⁴⁴ *Ibid*.

²⁴⁵ Interviewee in Lorca and others (n156) 7.

²⁴⁶ Javier Guzmán and others, 'Evolution of the Surface Area of Critical Lagoon Systems in the Salar de Atacama' (2022) Remote Sensing

the lagoons, it does not assess subsurface hydrological changes or wider ecological impacts on biodiversity and Indigenous livelihoods.²⁴⁷

Environmental Impact Assessment System (SEIA)

Environmental Impact Assessments constitute the principal mechanism through which the environmental impacts of lithium extraction are assessed and regulated in Chile. Environmental approval for lithium projects in Chile takes place through the Sistema de Evaluación de Impacto Ambiental (SEIA), administered by the Servicio de Evaluación Ambiental (SEA). As discussed in the legal framework, projects likely to cause significant environmental impacts must undergo environmental assessment before approval.²⁴⁸

Within the Salar de Atacama, Environmental Impact Assessments evaluate potential impacts on groundwater and brine resources, aquifers, wetlands (bofedales), salt-flat hydrology, biodiversity, endemic flora and fauna, air quality, soil quality and cumulative environmental impacts. They also assess cultural heritage, Indigenous customs, archaeological and sacred sites and traditional livelihoods. Indigenous consultation under Supreme Decrees No. 40/2012 and No. 66/2013 is undertaken through this process where consultation requirements are triggered (see Consultation section below).²⁴⁹

UN Special Rapporteur's Environmental Findings

In 2023, the UN Special Rapporteur on Human Rights and the Environment, Dr David Boyd, visited Chile to assess the challenges facing the implementation of the right to a clean, healthy and sustainable environment. Boyd visited a number of sites, including the Salar de Atacama.²⁵⁰ Although he did not classify the Salar de Atacama itself as a sacrifice zone, he identified nearby Calama as one of Chile's environmental sacrifice zones, highlighting the cumulative impacts of extractive industries across northern Chile. While this designation does not explicitly extend to the Salar de Atacama, it situated lithium extraction within a broader regional context characterised by intensive resource extraction.²⁵¹

²⁴⁷ Vera and others (n 45) 159

²⁴⁸ Ley sobre Bases Generales del Medio Ambiente (Chile) Ley No 19.300, Diario Oficial, 9 March 1994; Reglamento del Sistema de Evaluación de Impacto Ambiental (Chile) Decreto Supremo No 40, Ministerio del Medio Ambiente, Diario Oficial, 12 August 2013; Servicio de Evaluación Ambiental (SEA), 'Sistema de Evaluación de Impacto Ambiental (SEIA)'.

²⁴⁹ Ley sobre Bases Generales del Medio Ambiente (Chile) Ley No 19.300, Diario Oficial, 9 March 1994; Reglamento del Sistema de Evaluación de Impacto Ambiental (Chile) Decreto Supremo No 40, Ministerio del Medio Ambiente, Diario Oficial, 12 August 2013 arts 85–94; Ministerio de Desarrollo Social, Reglamento que Regula el Procedimiento de Consulta Indígena en virtud del artículo 6 No 1 letra a) y No 2 del Convenio No 169 de la Organización Internacional del Trabajo (Chile) Decreto Supremo No 66, Diario Oficial, 4 March 2014.

²⁵⁰ United Nations Human Rights Council, Visit to Chile (n35) para 4.

²⁵¹ Ibid para 10.

Boyd also criticised Chile's privatised water rights regime, arguing that the 1981 Water Code and 1980 Constitution allow industrial agriculture and mining to control water resources at the expense of rural and Indigenous communities.²⁵² He described it as "unacceptable" that mining companies consume "massive volumes of water" while many rural residents and Indigenous communities lack reliable access to safe and sufficient water. He further stated that international human rights law requires water allocation to prioritise human consumption first, ecosystems second and industry third, a hierarchy that he argued is reversed under Chile's existing water governance system.²⁵³

5.6 Corporate Environmental Responses

After the SMA initiated proceedings against SQM in 2016 the company expanded its environmental monitoring systems. SQM now operates a public platform providing information on brine extraction, freshwater use, hydrological conditions and ecological indicators, and reports reducing actual freshwater abstraction from its authorised allocation of 240 litres per second to approximately 120 litres per second across its five active wells in 2023. SQM also claims that it conducts continuous monitoring of the wider ecosystem factors such as the brine levels, lagoons, vegetation and flamingo populations, and has developed a hydrogeological model to support long-term management of the Salar de Atacama ecosystem.²⁵⁴

Unlike SQM, Albemarle's freshwater extraction rights is only 23.5 litres per second, and states that less than half of this allocation is currently used. Albemarle has similarly developed environmental monitoring and efficiency measures linked to its operational agreements and environmental approvals. The company reports having already achieved its target of reducing freshwater use by 25% by 2030 (from a 2019 baseline) through efficiency improvements and the Salar Yield Improvement Project (SIYP).²⁵⁵

5.7 Expansion through Direct Lithium Extraction

Despite concerns over environmental fragility and impacts, Chile's National Lithium Strategy seeks a substantial expansion of lithium production through new public-private partnerships and the deployment of new extraction technologies.²⁵⁶ Both SQM and Albemarle are investing in Direct Lithium Extraction (DLE) that will enable them to recover up to around 80% of the lithium contained in brine, compared to 40–65% under the conventional evaporation-pond

²⁵² *Ibid para 31.*

²⁵³ *Ibid para 7.*

²⁵⁴ Sociedad Química y Minera de Chile SA (SQM), Sustainability Report 2023 (2024); SQM Salar Monitoring Platform

²⁵⁵ Albemarle Corporation, 2023 Sustainability Report (2024); Albemarle Chile Environmental Information.

²⁵⁶ Gobierno de Chile, National Lithium Strategy (2023).

method.²⁵⁷ Unlike conventional evaporation methods, DLE chemically extracts lithium from pumped brine before reinjecting the lithium-depleted brine back into the salar, substantially reducing reliance on large evaporation ponds.²⁵⁸

The primary purpose of DLE is to increase lithium recovery and production efficiency, yet both companies frame DLE as a sustainable innovation as there are possible beneficial factors for the local environment, the largest being the retention of water within the hydrological system.²⁵⁹ The companies have committed to "preserve the hydrological and geochemical balance"²⁶⁰ as they deploy this technology, a voluntary commitment and not a mandated requirement. However, although DLE has the potential to reduce reliance on evaporation ponds and improve lithium recovery, its long-term hydrogeological and ecological impacts remain uncertain. Consequently, while industry presents DLE as a sustainable innovation, its environmental benefits have yet to be conclusively demonstrated at scale.²⁶¹

5.8 Indigenous Connection, Consultation and Conflict

The Indigenous connection with the hydroecological system of the Salar de Atacama extends far beyond the quantity or chemical composition of water. For the Atacameño people, territory, water, wetlands, mountains and salt flats form an interconnected socio-ecological system in which the physical, cultural and spiritual dimensions of the landscape cannot be separated. Anthropological research describes water not merely as a natural resource but as a living entity embedded within reciprocal relationships between people, ancestors and the wider landscape, with responsibilities of care extending across the territory rather than being confined to individual water sources.²⁶²

For the Atacameño people, water, or 'puri' in the Kunza language, has a sacred character and is understood as a living being.²⁶³ The saying "the blood is the water" reflects a holistic understanding of the hydrological system, whereby groundwater, lagoons, wetlands and surface waters are viewed as parts of a single interconnected system. Consequently, extraction in one location is understood to affect the integrity of the whole ecosystem.²⁶⁴ Although communities hold legal water rights under the Chilean Water Code, many reject the commodification of water

²⁵⁷ Vera and others (n5) 155.

²⁵⁸ *Ibid* 154

²⁵⁹ *Ibid*

²⁶⁰ Corporación de Fomento de la Producción (CORFO), CORFO and Albemarle Reach Agreement for Sustainable Lithium Production in the Salar de Atacama (15 May 2024).

²⁶¹ Vera and others (n45) 159; van Pampus and others (n34)

²⁶² Sally Babidge, 'Contested Value and an Ethics of Resources: Water, Mining and Indigenous People in the Atacama Desert' (2016) *Journal of Political Ecology*

²⁶³ Jerez and others (n 45) 9 .

²⁶⁴ *Ibid*

itself, maintaining that “The waters cannot be traded. Water is sacred. It is powerful, it is life, it is our vein, it is our blood ...”²⁶⁵

Local Perceptions on The Green Transition

The indigenous communities, although each holding their own individual opinions, appear from the interviews to express a viewpoint that is not totally at odds with the global climate narrative. There are members who welcome technology and appreciate the need to tackle climate change but they argue that this should not come at the expense of local ecosystems.²⁶⁶ In a BBC News documentary, the President of the Peine Indigenous Community states “we understand that the world needs to transform conventional energy into renewable energy... But we also don't want to be the bargaining chip for that development”²⁶⁷.

Some express fear for the end of their way of life. “One day it will end... What are people going to do without water?”.²⁶⁸ While some Indigenous activists like Sonia Ramos argue that extraction is “destroying a place far more valuable than the lithium”.²⁶⁹ The global paradox of the distribution of benefits and burdens is front of mind for many. Fabiola, a local biologist rhetorically asks, “Who are the electric cars going to be for? Europeans, Americans, not for us”.²⁷⁰ Some may be hopeful that technologies like Direct Lithium Extraction might be the short-term answer but are skeptical of these being deliverable at speed and with efficacy and question potential effects on the ecosystem.²⁷¹ Others suggest that there should be a greater connection with Indigenous people who understand the landscape.²⁷²

The Council of Atacameño People

Consejo de Pueblos Atacameños (The Council of Atacameño People - CPA) emerged in 1992 as a co-ordinating platform to gather authorities on traditional beliefs and customs, and community leaders from the villages surrounding the Salar de Atacama, with the aim of expressing a single ‘Indigenous voice’ for their political and cultural claims.²⁷³ However, confrontation with mining and other interests bubbled to the surface, with resource protection particularly water high on the

²⁶⁵ Atacameño farmer from the Toconao community in Jerez (n XX) page xx.

²⁶⁶ Alexander Dunlap, 'Does Renewable Energy Exist? Fossil Fuel+ Technologies and the Search for Renewable Energy' in Susana Batel and David Rudolph (eds), *A Critical Approach to the Social Acceptance of Renewable Energy Infrastructures: Going Beyond Green Growth and Sustainability* (Palgrave Macmillan 2021)

²⁶⁷ BBC News, What is the impact of lithium mining? (YouTube, 25/05 2025)
<<https://www.youtube.com/watch?v=hthe8OqRmcs>> accessed 23 July 2026.

²⁶⁸ Ibid

²⁶⁹ CNBC, Why Chile’s Lithium Mining Is At A Crossroad. (Youtube 05/05/2023)
<https://www.youtube.com/watch?v=HSh6EgMwMOY>> accessed 23 July 2026.

²⁷⁰ BBC News, What is the impact of lithium mining? (YouTube, 25/05 2025)
<<https://www.youtube.com/watch?v=hthe8OqRmcs>> accessed 23 July 2026.

²⁷¹ Ibid

²⁷² Ibid

²⁷³ Lorca and others

agenda.²⁷⁴ The attempted unification has also generated tensions among communities with different approaches and opinions to feel unrepresented and conflicts over the benefits and costs, and disagreements around inclusion and exclusion.²⁷⁵

Benefit-Sharing

Lithium revenues from royalties and taxes flow into the Chilean treasury and contribute towards social spending on education, infrastructure and public services. However this money is typically distributed across the country and is not specifically reserved for lithium-affected communities.²⁷⁶ Instead, the principal mechanisms through which Atacameño communities receive direct economic benefits arise from company-specific agreements negotiated with CORFO and Indigenous communities during the renegotiation of the lithium contracts.²⁷⁷ These arrangements pre-date Chile's 2023 National Lithium Strategy, which retained rather than created this model of benefit-sharing.²⁷⁸

Both Albemarle and SQM have formal benefit-sharing agreements with Atacameño communities, but these are structured completely differently, which makes comparison difficult. Albemarle's first attempt goes back to 2012, when its predecessor, Rockwood, signed an agreement with the Peine community.²⁷⁹ This was followed by a broader 2016 Cooperation, Sustainability and Mutual Benefit Agreement with the CPA as a whole. Under this agreement, Albemarle commits a fixed 3.5% of sales from its Chilean lithium and potassium operations to community-selected projects.²⁸⁰ Around 80 projects have been reported to date including a photovoltaic plant, drinking water and sewerage infrastructure, public lighting, community centres, and around 500 scholarships.²⁸¹

SQM's arrangement works differently. Rather than allocation a fixed percentage, its CORFO contract commits it to community investment funded through its own set of formulas.²⁸² SQM frames its approach around "shared value creation" through dialogue, long-term relationships, and participation in community development programmes.²⁸³ Gonzalo Guerrero Yamamoto, Chairman of the SQM Board states "We have made a contribution to each of the territories where

²⁷⁴ Lorca and others (n156)

²⁷⁵ Ibid; Morales (n45)

²⁷⁶ Gobierno de Chile, Estrategia Nacional del Litio (2023); Comisión Chilena del Cobre (COCHILCO), Lithium in Chile

²⁷⁷ CORFO, Contrato de Arrendamiento Proyecto Salar de Atacama (2018); CORFO, 'CORFO and Albemarle Sign New Agreement for the Exploitation of Lithium in the Salar de Atacama' (2016).

²⁷⁸ Gobierno de Chile, Estrategia Nacional del Litio (2023).

²⁷⁹ Albemarle Corporation, 2024 Sustainability Report (2025).

²⁸⁰ CORFO, 'CORFO and Albemarle Sign New Agreement for the Exploitation of Lithium in the Salar de Atacama' (2016).

²⁸¹ Albemarle Corporation, 2024 Sustainability Report (2025).

²⁸² CORFO, Contrato de Arrendamiento Proyecto Salar de Atacama (2018).

²⁸³ SQM, Integrated Report 2024 (2025).

we are present, which has allowed us to generate shared social value with all of our stakeholders in Chile and the world”.²⁸⁴ SQM reports more than 70 community programmes in 2024, spanning education, culture and heritage, training and local development, and support for community infrastructure and social programmes.

Based on publicly reported figures for 2024, Albemarle's contractual commitment of 3.5% of revenue would amount to approximately **US\$29.1 million**, whereas SQM reported **US\$24.9 million** in community investment related to its Salar de Atacama operations.²⁸⁵ Although these figures suggest broadly comparable levels of investment, they are derived from different reporting frameworks and therefore cannot be directly compared. Together, these agreements represent the principal mechanisms through which economic benefits from lithium extraction are transferred directly (or indirectly in the case of investing in social programmes and infrastructure) to Atacameño communities.²⁸⁶

Consultations

Before the ILO Convention 169 companies negotiated in an informal way, usually through bilateral conversations with individual community presidents rather than with all the communities of the CPA.²⁸⁷ This was "understood as a non-binding 'good neighborly' action," not as binding consultation.²⁸⁸ After the ILO 169 came into force in Chile and conflicts intensified, SQM strengthened its environmental and community relations structures while Albemarle hired a consulting firm for an environmental impact study and procedures around consultations were formalised.²⁸⁹

Indigenous consultation became formally embedded within the Sistema de Evaluación de Impacto Ambiental (SEIA), Chile's environmental impact assessment system under Supreme Decrees No. 40/2012 and No. 66/2013²⁹⁰. Under this framework, consultation is triggered when an individual mining project is submitted to the state for environmental approval, and Atacameño communities are asked to submit observations that the developer is required to respond to²⁹¹.

²⁸⁴ SQM, Integrated Report 2024 (2025).

²⁸⁵ Albemarle Corporation, 2024 Sustainability Report (2025); SQM, Integrated Report 2024 (2025).

²⁸⁶ CORFO, Contrato de Arrendamiento Proyecto Salar de Atacama (2018); CORFO, 'CORFO and Albemarle Sign New Agreement for the Exploitation of Lithium in the Salar de Atacama' (2016).

²⁸⁷ Sally Babidge, 'Indigenous People, Mining and the Possibilities of Procedural Justice in Chile' (2019) International Journal on Minority and Group Rights.

²⁸⁸ Ibid

²⁸⁹ Ibid

²⁹⁰ Decreto Supremo N° 40/2012, Ministerio del Medio Ambiente, Chile; Decreto Supremo N° 66/2013, Ministerio de Desarrollo Social, Chile.

²⁹¹ Servicio de Evaluación Ambiental (SEA), 'La Consulta Indígena en el SEIA' (Revista Ius Novum, n.d.); Ley No 19.300 sobre Bases Generales del Medio Ambiente; Decreto Supremo No 40/2012.

Consistent with ILO Convention 169, Chilean law obliges the state to make “good-faith efforts” to reach agreement with consulted communities.²⁹² However as long as the process meets the conventions standards, consent does not need to be reached for approval to be granted nor does it give indigenous communities decision-making or veto power over project approvals.²⁹³ Despite this consent not being required however, an analysis of official Servicio de Evaluación Ambiental (SEA) data by Silva Valenzuela and Jara-Villalobos found that 72.3% of Indigenous consultation processes conducted through the SEIA system resulted in either full or partial agreement with the communities consulted.²⁹⁴

Both companies have also provided ways for community members to participate actively in monitoring and dialogue.²⁹⁵ Albemarle organises joint monitoring missions with community representatives,²⁹⁶ whilst SQM has similar arrangements with local community groups, setting up technical working groups with specific communities.²⁹⁷

Anthropological studies similarly indicate that consultation and negotiation processes do occur in practice.²⁹⁸ The CPA claims to speak for all 18 member communities, but in practice negotiates selectively, which has spurred some communities to constitute themselves independently in order to negotiate their own terms.²⁹⁹ This fragmentation was made visible in the 2023 Codelco-SQM transition (the state-private sector coalition proposed in the National Lithium Strategy).³⁰⁰ The alliance was announced before any formal Indigenous consultation had taken place, with consultation only initiated in 2024 after the agreement had already been confirmed³⁰¹. In protest, CPA-led communities established roadblocks at Salar de Atacama operations though these were called off partly due to internal divisions within the CPA itself over how to respond.³⁰² The 2026 "Salar Futuro" deal with SQM has produced a similar dynamic, again fracturing Indigenous communities rather than unifying them around a shared position³⁰³

UN Special Rapporteur Indigenous Rights Findings and Recommendations

²⁹² Indigenous and Tribal Peoples Convention, 1989 (No 169), art 6.

²⁹³ ILO Convention No 169 arts 6–7; Decreto Supremo No 66/2013.

²⁹⁴ Nicolás Silva Valenzuela and Camilo Andrés Jara Villalobos, 'La Consulta Indígena de Proyectos de Inversión en el Sistema de Evaluación de Impacto Ambiental: Antecedentes y Resultados a una Década del D.S. 66/2013' (2023) 20 *Revista de Derecho Ambiental* 215, 229–231.

²⁹⁵ Albemarle Corporation, 2024 Sustainability Report.

²⁹⁶ Albemarle Corporation, 2024 Sustainability Report.

²⁹⁷ SQM, Integrated Report 2023.

²⁹⁸ Babidge (n45); C Jerez and others (n56)

²⁹⁹ Lorca (n156)

³⁰⁰ Government of Chile (n135)

³⁰¹ A. Chagnon et al., 'Chile's lithium exceptionalism: Strategic legacies and the contested future of the Salar de Maricunga' (2025) *The Extractive Industries and Society*, ScienceDirect.

³⁰² Mining.com, 'Communities agree to end roadblocks at Chile lithium operations' (15 January 2024).

³⁰³ <https://www.climatechangenews.com/2026/03/18/landmark-deal-to-share-chiles-lithium-windfall-fractures-indigenous-communities/>

The UN Special Rapporteur on the Rights of Indigenous Peoples concluded that, despite Chile's Indigenous legislation, limited progress has been made in restoring Indigenous lands and waters while extractive activities continue to expand. During his visit to the Atacama region, the Rapporteur identified shortcomings in the provision of information, participation in decision-making and the implementation of free, prior and informed consent for Indigenous peoples affected by mining and renewable energy projects. He recommended that Chile ensure that FPIC is respected, that Indigenous peoples participate effectively in decision-making, and that benefits from development are shared equitably. The Rapporteur further emphasised that a human rights-based approach is a legal obligation of the Chilean State and is essential to achieving socially and environmentally sustainable development.³⁰⁴

Chapter 6 - Analysis: Environmental Justice and the Limits of Governance

6.1 Environmental Justice

The key analytical question is whether current governance frameworks merely manage the impacts of extraction or whether they possess sufficient authority and enforcement capacity to prevent environmental injustices from occurring in the first place. Although international environmental and human rights frameworks establish wide-ranging protections for biodiversity, water resources and affected communities, significant questions remain regarding their effectiveness in governing large-scale extractive activities at regional and local levels.

Building on this foundation, I will assess the legal frameworks that I have identified for this thesis and will analyse whether they are sufficient to meet the three key environmental justice criteria, these being distributional, procedural and recognitional justice for Indigenous communities, with respect to the lithium extractive industry in the Salar de Atacama.

6.1.1. Distributional Justice

Distribution of Harms

Distributional Justice is concerned with how burdens and benefits are distributed throughout society.³⁰⁵ From the evidence presented in the case study above, there are multiple levels of distributional imbalance with respect to harms that are caused locally. There is some intervention

³⁰⁴ United Nations Human Rights Council, Visit to Chile (n 45) para 60.

³⁰⁵ Benjamin K Sovacool, The Routledge Handbook of Energy Security (or whichever Sovacool environmental justice source you have used consistently).

from the state on a national level, including water rights, extraction quotas, consultation requirements and compensation requirements, however these mitigate and manage the downsides, as opposed to eradicating damage altogether.³⁰⁶

On the community level there is an unequal distribution of harms between groups, leading to inter-community tensions and community fragmentation. The harms are experienced locally, whilst the benefits - these being renewable energy and electrification - are being reaped elsewhere. The UN Special Rapporteur, Boyd, viewed the Salar de Atacama as a site of profound distributive injustice, where the ecological and social burdens of the "green" transition are concentrated on marginalized Indigenous populations.³⁰⁷

Although this region is not a legal designation with respect to sacrifice zones, and therefore is presently without statutory criteria, it could be argued that the Salar de Atacama constitutes a sacrifice zone.³⁰⁸ There have been cases where the companies have been required to restore the ecosystem.³⁰⁹ However, lack of scientific evidence or in-depth studies to date means that the local environmental effects of brine extraction and large-scale evaporation may be altering the ecological balance, but long term studies on, for the flamingo population, are not yet available.³¹⁰

Communities have formed protests seeking to halt mining expansion on the basis of “the injustice of sacrificing marginal, ‘forgotten corners’ of the world to power a transition to ‘green’ forms of energy in the global North”.³¹¹ These residents see themselves as “the bargaining chip for [global energy] development”,³¹² being put at risk of environmental sacrifice for the “lithium fever” of the Global North,³¹³ described in the literature as ecological unequal exchange.³¹⁴

Distribution of Benefits

³⁰⁶ Ley No 19.300 sobre Bases Generales del Medio Ambiente; Decreto Supremo No 40/2012; Indigenous and Tribal Peoples Convention, 1989 (No 169); CORFO, Contrato de Arrendamiento Proyecto Salar de Atacama (2018).

³⁰⁷ Human Rights Council, Report of the Special Rapporteur on the Rights of Indigenous Peoples, José Francisco Calí Tzay: Visit to Chile UN Doc A/HRC/55/43/Add.1 (2024).

³⁰⁸ David R Boyd, Paying the Price: The Human Cost of Environmental Harm (UN Special Rapporteur, 2024); Alexander A Dunlap, 'Love the State, but Hate (Neo)Colonialism? Discussing Sacrifice Zones and (Green) Colonialism in Political Ecology' (2026) 13 Geo: Geography and Environment e70069.

³⁰⁹ Superintendencia del Medio Ambiente, Resolution approving Albemarle's Programme of Compliance (2024).

³¹⁰ Jerez (n33)

³¹¹ Lorca (n156)

³¹² BBC News (n23)

³¹³ Ibid

³¹⁴ Surya Deva and S Anand, The Just Transition to a Green Economy (or the Deva & Anand source you are using throughout your dissertation).

Whilst mining revenues for Chile flow directly to the treasury and are distributed across Chile, specific benefits for affected communities can be found in the renegotiated contracts with SQM and Albemarle. Both of these benefit-sharing requirements come from the contracts rather than any general mining law or direct statutory royalty deriving from lithium extraction. The National Lithium Strategy did not create a Canadian-style Indigenous benefit-sharing law where communities automatically receive a fixed percentage of mining revenue.³¹⁵

Company sustainability reports confirm that contributions are indeed being made, but their sufficiency remains difficult to assess. SQM discloses that its community contribution payments have repeatedly fallen short of the provisioned amounts, and research and development provisions have not been paid since 2018.³¹⁶ Albemarle's figures raise even harder-to-resolve problems. Since the vast majority of its reported Chilean revenue is an internal transfer price to its own US parent company, and there is no way to independently verify whether its actual reinvestment rate is higher or lower than the company's headline 3.5% commitment suggests.³¹⁷

SQM's disclosures show a persistent gap between provisioned and disbursed community contributions. There is zero disbursement every year since 2018.³¹⁸ This is a shortfall that pre-dates and is therefore not explained by a court-related freeze. Separately, a portion of SQM-derived community funds has also been held up by a genuine governance dispute: a 2022 Supreme Court ruling found CORFO had failed to properly consult communities on the distribution formula for a related fund, freezing roughly US\$28.9 million until a court-ordered consultation concluded in 2024.³¹⁹ Whether these two gaps are fully or partially the same pot of money is not established from public sources. Taken together, they show that both corporate non-delivery and state/regulatory dysfunction are contributing to a persistent shortfall between what communities are promised and what they actually receive.

Given this gap between disclosed commitments and verifiable delivery, it is unsurprising that community members hold varying views and express feelings of being short-changed, 'paid off' or misled. These programmes are intended to create shared social value with the communities and to mitigate some of the harms and conflicts through compensation and development. Yet some members see them as derisory or insufficient,³²⁰ while others are disillusioned, questioning whether the state will be able to prevent potential ecological destruction. They see themselves as paying the price of extraction. One of Lorca's interviewees expressed the belief that compensation is an "opportunity cost" for what some perceive as the inevitable drying up of the

³¹⁵ Gobierno de Chile, Estrategia Nacional del Litio (Gobierno de Chile 2023).

³¹⁶ SQM, Integrated Report 2024 146–149.

³¹⁷ Albemarle Corporation, 2024 Sustainability Report 54–58.

³¹⁸ SQM, Integrated Report 2024 148.

³¹⁹ Corte Suprema de Chile, Judgment Rol No 23.566-2022 (2022).

³²⁰ Bastida (n23)

salt flats, and that communities should squeeze what compensation they can, while they can.³²¹ Babidge similarly argues that indigenous communities should not just be “minor” partners in agreements as they are the ones which have the most at stake.³²²

This dynamic has been theorised in increasingly critical terms. Lorca frames these agreements as a form of social licensing, in which corporate-community deals allow companies to effectively “buy” local acceptance for continued operations.³²³ Dunlap goes further, describing such programmes as “acceptance technologies” or instruments of “coercive pacification” that actively incentivise communities to accept the trade of natural resources for money or the promise of development and community resources.³²⁴ Gundermann and Göbel (2018) offer a more measured reading, situating these agreements within a corporate logic of “shared values,” in which companies distribute a share of their gains to reduce friction with local communities; crucially, they also note that communities bring their own strategic agenda to these negotiations, seeking to maximise bargaining power and steward mining activity on their own terms.³²⁵ Even allowing for this agency, many critics remain sceptical that these arrangements represent any genuine redistribution of power, viewing them instead as a mechanism for co-opting community leadership within a fundamentally unequal relationship.³²⁶

Although the idea of compensation and consultation is to reduce the objections that the local communities have towards the mining companies, this can cause both inter- and intra-community conflicts as some communities benefit more than others and different communities choose to negotiate community-corporate relationships in different ways. The Camar Indigenous Community lawsuit against CORFO illustrates this, as the case disputed that CORFO was not taking into account distributions of harms when distributing benefits. This case pitted the southern communities, which felt more directly affected, against the other communities, creating tensions at the local level that subsequently escalated the case to the Supreme Court.³²⁷

Unequal compensation can lead to unequal bargaining power and to community fragmentation, involving conflicts over territory and or even around “indigenusness”.³²⁸ Many theorists have argued that compensation is not the same as consent or full buy-in and that this tension between economic incentives and the protection or loss of territory causes a “functional dualism”, meaning that community members begrudgingly accept compensation whilst holding

³²¹ Lorca, and others (n156) 18

³²² Babidge (n287) page.

³²³ Lorca to others (n156) 18.

³²⁴ Dunlap (n43) 441

³²⁵ Hans Gundermann and Barbara Göbel, 'Comunidades indígenas, empresas del litio y sus relaciones en el Salar de Atacama' (2018) 50(3) Chungará: Revista de Antropología Chilena 471.

³²⁶ Dunlap (n43) 441–443.

³²⁷ Corte Suprema (n319).

³²⁸ Lorca and others (n156) 3.

anti-mining sentiments.³²⁹ Others claim that cultural and ecological values should not be reducible to financial compensation.³³⁰ Compensation can feel coercive, a means of pacifying resistance. Jerez and colleagues argue that the "developer pays" model in the Salar de Atacama results in a "colonial shadow," where Global North companies pay small royalties or compensation to make "invisible" the massive ecological destruction of "water mining".³³¹

Overall, governance has improved in terms of securing and redistributing some economic benefits since the contracts were renegotiated, however these are still deeply contested as to their sufficiency, intention and effectiveness. Some argue that they are a coercive attempt to continue to concentrate environmental burdens disproportionately among Indigenous communities surrounding the Salar de Atacama.³³² Distributional injustice arises because the benefits of lithium extraction benefit shareholders and national economies, while the risks of water depletion and ecological change are experienced disproportionately by local Indigenous communities who depend on these fragile water systems. Therefore, a lithium project generating national revenue may still be considered unsuccessful if it causes irreversible ecological damage or undermines Indigenous territorial rights.³³³

6.1.2 Procedural Justice

Procedural justice is arguably the strongest of the three dimensions of environmental justice in the Salar de Atacama, because formal mechanisms of participation have expanded more significantly than the mechanisms for redistributing benefits, authority or recognition. Compared with earlier periods of lithium governance, Indigenous consultation has become institutionalised through ILO Convention 169, Chile's SEIA process and participatory monitoring arrangements. Nevertheless, participation remains constrained by legal, epistemic (knowledge gathering, validating and sharing), and political inequalities that limit Indigenous influence over extraction decisions.³³⁴

Institutionalised Consultation

The requirement for consultation stems from the adoption of the ILO Convention 169 and cannot be directly attributed to the change from a neoliberal to more state-led governance model. However it could be argued that resource nationalism has expanded the governance arena in

³²⁹ Ibid, 9.

³³⁰ Ibid

³³¹ Jerez, and others (n23) 8

³³² Dunlap (n56) 441

³³³ Schlosberg (n4).

³³⁴ Schlosberg, (n56) 26..

which consultation occurs, through increased state oversight. Many see this as a significant improvement from informal arrangements to institutionalised consultations, dialogues and shared monitoring procedures within environmental governance.³³⁵ According to Chile's Environmental Assessment Service (SEA), 72.3% of Indigenous consultations conducted through the SEIA system have resulted in agreements.³³⁶

Consultation vs Consent

Despite these improvements, many critics see this process as insufficient, pointing out that consultation does not equate to consent. The United Nations Department for the Rights of Indigenous Peoples (UNDRIP) establishes Free Prior and Informed Consent as the normative benchmark, but as this is a declaration (not a treaty like ILO 169), it is not legally enforceable. This creates a gap between the strongest normative standard (FPIC) and the strongest enforceable standard (ILO 169 consultation).³³⁷

Chile's consultation framework therefore meets an important international, procedural obligation but does not fully satisfy the stronger normative expectations associated with FPIC. Consultation processes are sometimes presented as if they constitute FPIC, even though communities retain limited influence over the final decision.³³⁸ As Riofrancos argues, communities may therefore be extensively consulted while remaining unable to prevent extraction from proceeding.³³⁹ Formal participation consequently may not eliminate or change the structural power dynamics between Indigenous communities, mining companies and the Chilean state.³⁴⁰

Invited Participation

Consultation occurs within a governance framework where lithium extraction has already been established as a national strategic priority, that is, as part of the broader political and economic strategy. Consequently, consultation does not necessarily allow Indigenous communities to decide whether lithium extraction should take place. Instead, Indigenous communities are invited to shape implementation and advocate for less harmful and more favourable local outcomes, but not to determine the project's legitimacy.³⁴¹

³³⁵ International Labour Organization, Indigenous and Tribal Peoples Convention, 1989 (No 169) (adopted 27 June 1989, entered into force 5 September 1991).

³³⁶ Servicio de Evaluación Ambiental (SEA), Consulta Indígena en el SEIA (2025).

³³⁷ United Nations General Assembly, United Nations Declaration on the Rights of Indigenous Peoples GA Res 61/295 (13 September 2007) arts 10, 19, 29 and 32.

³³⁸ FIDH, Chile and the Indigenous Peoples: The Human Rights Impact of Lithium Mining in the Salar de Atacama (FIDH 2024) 108.

³³⁹ Riofrancos (n49) 147.

³⁴⁰ Schlosberg (n 56) 81.

³⁴¹ Fédération Internationale pour les Droits Humains, Chile and the Indigenous Peoples (n 6) 36; Mauricio Lorca and others (n 5) 10.

Dunlap has termed this “invited participation”, where the scope of debate is constrained to mitigation measures, monitoring and compensation rather than the project’s fundamental existence.³⁴² This creates a form of participation without equivalent decision-making authority, where communities can influence the conditions of extraction but not the broader development pathway.³⁴³

Delayed Consultation

The 2023 Codelco-SQM alliance further illustrates the procedural limitations of consultation. The partnership was publicly announced on 27 December 2023, before any formal Indigenous consultation had taken place, with consultation only commencing in 2024 after the agreement had already been confirmed.³⁴⁴ ³⁴⁵ This sequencing prompted rare community road blockades in the Salar de Atacama as consultation cannot be considered “prior” when it followed, rather than informed, a major strategic decision.³⁴⁶

Scientific Expertise and Access to Information

Even when communities are formally included in consultation processes, meaningful participation depends upon access to knowledge, expertise and the capacity to contest scientific claims. Under the Escazu Agreement, the communities have access to environmental impact assessments, technical reports, environmental monitoring data, and consultation documents which are held by the state. The state guarantees access to the information held by public authorities, and to make details on proposed projects publicly available.³⁴⁷ ³⁴⁸ However, these are required to be commissioned and funded by the companies planning the extraction. This means that the benefitting companies hold a “research monopoly” where they can considerably influence the production of knowledge. As Jasanoff argues, scientific knowledge is shaped by decisions about research questions, methodologies and the selection of experts. Consequently,

³⁴² Eefje Cuppen, ‘The Value of Social Conflicts: Critiquing Invited Participation in Energy Projects’ (2018) 38 *Energy Research & Social Science* 28, 28–31.

³⁴³ Cuppen (n 3) 29–31; Alexander Dunlap and Mariana Riquito, ‘Social Warfare for Lithium Extraction? Open-Pit Lithium Mining, Counterinsurgency Tactics and Enforcing Green Extractivism in Northern Portugal’ (2023) 95 *Energy Research & Social Science* 102912, 8–12.

³⁴⁴ Sociedad Química y Minera de Chile SA, ‘SQM Announces a Memorandum of Understanding with Codelco’ (27 December 2023)

³⁴⁵ Corporación Nacional del Cobre de Chile, ‘Comunidades Indígenas Atacameñas, Codelco y SQM acuerdan constituir Mesa de diálogo en el marco de la Estrategia Nacional del Litio’ (15 December 2023); Sociedad Química y Minera de Chile SA, ‘SQM Announces a Memorandum of Understanding with Codelco’ (27 December 2023)

³⁴⁶ *ibid*

³⁴⁷ Regional Agreement on Access to Information, Public Participation and Justice in Environmental Matters in Latin America and the Caribbean (adopted 4 March 2018, entered into force 22 April 2021) arts 5(1), 6(1), 6(3), 6(9), 6(12) and 7(17).

³⁴⁸ van Pampus M, Hogenboom B, Hoorn C and Seijmonsbergen AC, ‘Uncertainties in the Debate on the Environmental Impact of Lithium Brine Extraction in the Salar de Atacama, Chile’ (2023) 1 *Evolving Earth* 100024.

companies largely determine the scope of investigation, the evidence collected and the impacts prioritised within environmental assessments.³⁴⁹

In addition, although environmental information is publicly available under the Escazú Agreement, this information is usually in the form of highly technical and complex documents that indigenous communities may lack the specialised expertise to interpret. As one community informant explained “they give you a book you don't understand”.³⁵⁰ On the other hand, mining companies have access to consultants, engineers, lawyers and other highly-trained experts in the key fields of knowledge and experience.

Uncertainty Around Complex Ecosystems

In the Salar de Atacama, uncertainty exists around groundwater connectivity, aquifer recharge rates and cumulative and long-term ecological impacts. Although companies and regulators rely on technical models to evaluate risks, these models cannot fully eliminate uncertainty or determine what level of ecological change is acceptable. Funtowicz and Ravetz termed this as ‘post-normal science’, where decisions may be made despite uncertainty. Decisions are not necessarily scientifically based but are assessed according to the risks, existing studies and understandings are given authority.³⁵¹ The precautionary principle is rarely applied in favour of advancing with the best model available and responding to changes as they arise. Chilean regulators allowed extraction to continue subject to monitoring, contingency plans and adaptive management through a programme of compliance.³⁵²

Privileging one interpretation of information over another highlights the unequal power dynamics embedded in the environmental assessment system. The International Federation for Human Rights (FIDH) also found that right to consultation is limited to projects with “significant impact” which means that many projects impacted are not even considered worthy of discussion.³⁵³ This raises questions about who qualifies to decide what “significant impacts” constitute and the knowledge that is used to arrive at that conclusion. This also highlights the case-by-case approach taken by the state and the companies.

³⁴⁹ Jasanoff S, ‘The Idiom of Co-production’ in Sheila Jasanoff (ed), *States of Knowledge: The Co-production of Science and Social Order* (Routledge 2004)

³⁵⁰ Dorn and Gundermann (n 2) 351–52; van Pampus and others (n 3) 8–10.

³⁵¹ Silvio O Funtowicz and Jerome R Ravetz, ‘Science for the Post-Normal Age’ (1993) 25(7) *Futures* 739, 739–740.

³⁵² Superintendencia del Medio Ambiente, Resolución Exenta No 38/ROL F-041-2016, ‘Aprueba Programa de Cumplimiento presentado por SQM Salar SA y suspende procedimiento administrativo sancionatorio’ (29 August 2022); Superintendencia del Medio Ambiente, ‘SMA aprueba programa de cumplimiento que exige a SQM Salar medidas por más de 46.000 millones de pesos’ (30 August 2022) <https://portal.sma.gob.cl/index.php/sma-aprueba-programa-de-cumplimiento-que-exige-a-sqm-salar-medidas-por-mas-de-46-000-millones-de-pesos/> accessed 24 July 2026.

³⁵³ International Federation for Human Rights (FIDH), *Lithium and Human Rights in the High Andean Salt Flats of Argentina, Bolivia and Chile* (FIDH 2025) 108–109.

Recent consultation processes surrounding the Codelco-SQM partnership and the Salar Futuro agreement further demonstrate how consultation can produce fragmented rather than collective forms of governance. Rather than constituting a unified FPIC process, consultation in the Salar de Atacama increasingly resembles a landscape of bilateral agreements negotiated between individual communities and companies.

From an environmental justice perspective, the central issue is therefore not whether consultation occurs, but whether Indigenous communities possess meaningful influence over decisions affecting their territories, livelihoods and cultural relationships with land. Chile's governance model has significantly strengthened procedural inclusion through ILO Convention 169 and consultation procedures within environmental governance. However, these mechanisms remain limited because they prioritise consultation over consent, provide unequal access to expertise and retain decision-making authority within state and corporate institutions.

Overall, Chile's procedural framework demonstrates significant progress compared with purely extractive governance models. Instruments such as SEIA, Escazú, and ILO Convention 169 have expanded access to information, consultation, and participation. However, these mechanisms remain limited in their ability to alter the underlying distribution of decision-making power. Participation generally occurs within a framework where lithium extraction is already prioritised as a national strategic objective. Therefore, procedural safeguards may improve the legitimacy of extraction without necessarily preventing the conditions associated with environmental injustice.

6.1.3 Recognitional Justice

Recognitional justice examines whether the communities' identities, values, knowledge systems and relationships with nature are respected within environmental governance (Fraser; Schlosberg). For Indigenous peoples, environmental conflicts are not solely disputes over resources but also over the legitimacy of different ways of understanding land, water and territory.³⁵⁴

Recognition of Indigenous Relationships with Nature

Indigenous understandings frame the Salar's waters as part of an interconnected socio-ecological system with profound spiritual, cultural and material significance.³⁵⁵ The hydrological system is

³⁵⁴ Nancy Fraser, *Scales of Justice: Reimagining Political Space in a Globalizing World* (Polity Press 2008) 16–24; David Schlosberg, *Defining Environmental Justice: Theories, Movements, and Nature* (Oxford University Press 2007) 13–29.

³⁵⁵ Bárbara Jerez, Ingrid Garcés and Robinson Torres, 'Lithium Extractivism and Water Injustices in the Salar de Atacama, Chile: The Colonial Shadow of Green Electromobility' (2021) 87 *Political Geography* 102382, 5–9.

inseparable from the communities and species it sustains “water and land are life. The waters cannot be traded. Water is sacred. It is powerful, it is life, it is our vein, it is our blood ...”³⁵⁶ is a living element embedded within reciprocal relationships between people, territory and non-human life rather than a separate object that can be managed independently.³⁵⁷ Critically, water and brine are seen as part of the interconnected Salar water system. However the state and the extractive companies do see brine and water as distinctly different, legally defining brine as a “mineral” rather than water and the lithium within it as a strategic resource.³⁵⁸ Jerez and colleagues view this as a scientific and legal distortion that obscured the need for formal oversight of large-sale water evaporation.³⁵⁹

Schlosberg argues that environmental justice requires recognition of diverse relationships with nature as not just a cultural preference but a fundamentally different understanding of the human-environment relationship.³⁶⁰ From this perspective, extracting lithium cannot be understood solely as the removal of a mineral but as altering relationships that sustain both ecological and cultural life. By legally defining brine as a mineral rather than as part of an interconnected hydrological system, Chilean resource governance privileges an extractive understanding of the Salar while marginalising Indigenous understandings of water as a living and culturally embedded entity.³⁶¹

The lack of state recognition of the hydro-social complexity of the salt flat waters constitutes one of the biggest controversies around lithium mining.³⁶² This distinction is also evident in the legal claims brought by Indigenous communities, which have focused less on access to water itself than on the health and integrity of the Salar ecosystem as a whole.³⁶³ Rather than framing harm solely in terms of water quantity or quality, these challenges reflect concerns over the disruption of an interconnected ecological and cultural system.³⁶⁴ From a recognitional justice perspective, the conflict is therefore not simply over access to water but a wider dispute over ecosystems’

³⁵⁶ Jerez, Garcés and Torres (n 1) 9.

³⁵⁷ Kyle Powys Whyte, ‘Indigenous Environmental Justice: Anti-Colonial Action through Kinship’ in Brendan Coolsaet (ed), *Environmental Justice: Key Issues* (Routledge 2020) 266, 267–72.

³⁵⁸ Código de Minería, Ley No 18.248, Diario Oficial, 14 October 1983, arts 3 and 7; Decreto Ley No 2886, Diario Oficial, 14 November 1979, arts 4–5; Jerez, Garcés and Torres (n 1) 8–10.

³⁵⁹ Jerez, Garcés and Torres (n 1) 8–11. The authors describe the denial by companies and the state of the hydrological nature of brines as central to the water injustice produced by lithium extraction.

³⁶⁰ Schlosberg D, *Defining Environmental Justice: Theories, Movements, and Nature* (Oxford University Press 2007) 81–93, 138–56.

³⁶¹ Jerez, Garcés and Torres (n 2) 8–11; Código de Minería, Ley No 18.248, Diario Oficial, 14 October 1983, arts 3 and 7; Decreto Ley No 2886, Diario Oficial, 14 November 1979, arts 4–5.

³⁶² Bárbara Jerez, Ingrid Garcés and Robinson Torres, ‘Lithium Extractivism and Water Injustices in the Salar de Atacama, Chile: The Colonial Shadow of Green Electromobility’ (2021) 87 *Political Geography* 102382, 8–11.

³⁶³ Comunidad Indígena Atacameña de Peine and others v Superintendencia del Medio Ambiente, First Environmental Court, Joined Cases R-17-2019, R-18-2019 and R-19-2019 (26 December 2019).

³⁶⁴ Comunidad Indígena Atacameña de Peine and others v Superintendencia del Medio Ambiente, First Environmental Court, Joined Cases R-17-2019, R-18-2019 and R-19-2019 (26 December 2019).

which might become institutionalised within Chile's lithium governance.³⁶⁵ The Chilean state has increasingly recognised Indigenous people, but it has not equally recognised Indigenous ways of knowing nature or water.³⁶⁶

Recognition of Cultural Values

Within Chile's SEIA process, Environmental Impact Assessments (EIAs) do not assess only environmental impacts but also consider potential effects on Indigenous cultural heritage, traditional livelihoods and ways of life.³⁶⁷ Consultations are required under the ILO 169 if these types of impacts are deemed likely to be affected directly.³⁶⁸ This represents an important improvement in the recognition of Indigenous cultural rights within environmental governance. However, as impact assessments are designed to identify and evaluate discrete impacts through measurable indicators, they are less able to capture relational, spiritual and cumulative dimensions of cultural significance.³⁶⁹ Cultural relationships with water, territory and identity cannot always be translated into quantitative metrics or standardised assessment criteria.³⁷⁰ As Schlosberg argues, environmental justice requires recognition of diverse relationships with nature rather than reducing them to technical variables within environmental management. Consequently, although Indigenous cultural values are formally acknowledged within the SEIA process, they are interpreted through scientific and legal frameworks that are not developed on Indigenous terms. Following Fraser,³⁷¹ this represents only partial recognition, as Indigenous worldviews are incorporated into decision-making without being afforded equal authority in determining how impacts are defined or evaluated.

Recognition of Indigenous Knowledge

As discussed above, communities can access information but have unequal access to scientific expertise. EIAs are structured through methodologies that originated from Western scientific

³⁶⁵ David Schlosberg, *Defining Environmental Justice: Theories, Movements, and Nature* (Oxford University Press 2007) 81–93, 138–56; Jerez, Garcés and Torres (n 1) 8–11.

³⁶⁶ Jerez, Garcés and Torres (n 1) 8–11; Lorca and others, (n156) 8–11.

³⁶⁷ Decreto Supremo No 40/2012 del Ministerio del Medio Ambiente, Reglamento del Sistema de Evaluación de Impacto Ambiental, Diario Oficial, 12 August 2013, arts 7 and 10.

³⁶⁸ International Labour Organization, *Indigenous and Tribal Peoples Convention 1989* (No 169) (adopted 27 June 1989, entered into force 5 September 1991) 1650 UNTS 383, arts 6(1)(a) and 6(2); Decreto Supremo No 66/2013 del Ministerio de Desarrollo Social, Reglamento que Regula el Procedimiento de Consulta Indígena, Diario Oficial, 4 March 2014, art 7.

³⁶⁹ Sheila Jasanoff, 'The Idiom of Co-production' in Sheila Jasanoff (ed), *States of Knowledge: The Co-production of Science and Social Order* (Routledge 2004) 1, 2–6; Sally Babidge, 'Consultation's Overburden: Indigenous Participation in the Extractives Industry in the Salar de Atacama, Chile' (2019) 19(1) *Transformations* 16, 24–28.

³⁷⁰ *Ibid*

³⁷¹ Fraser N, 'Rethinking Recognition' (2000) 3 *New Left Review* 107

traditions. Just as the Indigenous communities may lack the skills to interpret this knowledge, so do the dominant institutions lack the understanding needed to incorporate Indigenous knowledge. Fricker terms this “hermeneutic inequality”, whereby dominant institutions lack the interpretive capacity to evaluate Indigenous forms of knowledge. This results in a crude translation of one form of knowledge to another rather than an alternative framework that evaluates knowledge on its own terms.³⁷²

Communities possess valuable ecological knowledge but do not hold equal status with scientific institutions to have this knowledge formally recognised. Whyte argues that this knowledge is not simply supplementary, local observations but a complete and sophisticated environmental governance system founded upon reciprocal relationships and environmental stewardship. However as the SEIA lacks an interpretive framework for this knowledge, it is therefore overlooked and subordinated to hydrological modelling. This creates a form of epistemic injustice, whereby Indigenous knowledge is formally invited into consultation yet remains subordinated to scientific expertise considered more authoritative within environmental assessment procedures.

From Recognition to Authority: The Limits of Indigenous Recognition in Resource Governance

Although frameworks such as ILO Convention 169 represent an important shift towards recognising Indigenous peoples as rights holders rather than merely stakeholders, the translation of these rights into practice remains limited. Indigenous communities are recognised as possessing collective, cultural, territorial and consultation rights; however, these rights are frequently operationalised through procedural mechanisms of consultation rather than through decision-making authority or shared governance.

Therefore, this reflects a broader tension identified within Indigenous experience and scholarship, where state recognition can acknowledge Indigenous difference while continuing to operate within state-defined frameworks of legitimacy and authority.³⁷³ As Borrows argues through the concept of legal pluralism (overlapping legal systems), Indigenous legal orders represent distinct areas of governance, knowledge and relationships that cannot be incorporated into existing state structures without altering underlying power relations.³⁷⁴ In the context of lithium extraction in the Salar de Atacama, this creates a tension between two governance

³⁷² Miranda Fricker, *Epistemic Injustice: Power and the Ethics of Knowing* (Oxford University Press 2007) 147–75.

³⁷³ Glen Sean Coulthard, *Red Skin, White Masks: Rejecting the Colonial Politics of Recognition* (University of Minnesota Press 2014) 3–24.

³⁷⁴ Borrows J, ‘Indigenous Legal Traditions in Canada’ (2005) 19 *Washington University Journal of Law & Policy* 167

systems attempting to coexist but operating according to different understandings of authority, evidence and acceptable harm. The central question therefore becomes not only whether Indigenous worldviews are recognised within governance frameworks, but whose worldview ultimately determines what forms of development are considered legitimate, whose knowledge is valued, and who has the authority to define and accept the environmental consequences of extraction.

6.2 Legal Frameworks Sufficiency

The previous sections have demonstrated that distributional, procedural and recognitional injustices persist in the Salar de Atacama despite the existence of an improving legal and governance framework. This is particularly significant because Chile has transitioned away from a purely neoliberal extractive model towards a more interventionist, resource nationalist approach.

However, while these developments represent progress, they have not been sufficient to deliver comprehensive environmental justice. Existing legal frameworks have improved recognition of Indigenous rights, increased procedural safeguards and strengthened environmental oversights to limited degrees, but they largely regulate the conditions under which extraction occurs rather than fundamentally transforming who has authority over extraction, how environmental risks are distributed, or whose knowledge determines acceptable levels of harm.

6.2.1 Legal Progress: strengthening rights, participation and environmental governance

There have undoubtedly been significant advances in the legal and policy landscape governing lithium extraction in Chile. The ratification and implementation of ILO Convention 169 has been particularly important in recognising Indigenous peoples as collective rights holders rather than simply as affected individuals. Through its requirement for prior consultation, ILO 169 has provided Indigenous communities with a legally recognised role in decisions affecting their territories and has become an instrument cited in Chilean Supreme Court decisions. Similarly, the Escazú Agreement represents an important development in environmental democracy by strengthening access to environmental information, public participation and access to justice. These mechanisms address some of the procedural exclusions that previously characterised environmental decision-making in extractive economies.

At the domestic level, Law 19.300 on the Environmental Framework and the Environmental Impact Assessment System (SEIA) have improved transparency and oversight by requiring projects to assess environmental consequences before approval and providing avenues through which citizens can challenge decisions.

However, these developments should not be attributed solely to Chile's shift towards resource nationalism. Many of the most significant legal changes, including the ratification of ILO Convention 169 in 2008 and later the Escazú Agreement, emerged from broader international and regional movements towards recognising Indigenous rights and environmental participation. It must be noted that even after ILO 169 entered into force, lithium extraction continued within a model largely characterised by private investment, export-oriented development and state facilitation of extraction.

Chile's National Lithium Strategy moves towards greater state involvement and public participation, and the strategy marks a shift in who governs and benefits from lithium extraction. However, this shift has primarily transformed questions of ownership, value capture and state oversight rather than fundamentally altering the justice experienced by affected communities. Resource nationalism has changed who captures economic value from lithium, but it has not necessarily changed who bears environmental risk or who possesses meaningful authority over extraction decisions.

6.2.2 Structural Legal Gaps Limiting Environmental Justice

Procedural Justice: consultation without consent

The most significant procedural limitation within the current framework is the gap between consultation and consent. Although ILO Convention 169 provides important recognition of Indigenous participation, its binding requirement is consultation rather than free, prior and informed consent (FPIC). This distinction is fundamental. States retain the ability to approve extractive activities where consultation has occurred, even where communities continue to oppose the project.

This is not simply a failure of implementation but a structural failure of the legal framework itself. Corporate sustainability reporting and state communication can use language that blurs the lines.

UNDRIP provides a stronger normative standard by recognising Indigenous peoples' right to participate in decisions concerning resource development. However, its non-binding nature significantly limits its ability to constrain state action. This creates a central contradiction within international Indigenous rights law: the strongest articulation of Indigenous self-determination is often the least legally enforceable.

Recognitional Justice: recognition without authority

Similar limitations emerge in relation to recognitional justice with improved recognition of Indigenous identity, cultural rights and the importance of Indigenous participation. However, recognition has largely occurred through consultation processes rather than through recognition of Indigenous communities as autonomous political actors with authority over territorial decisions.

This distinction is particularly important in the Salar de Atacama, where Indigenous communities possess complex relationships with land, water and ecosystems that do not necessarily align with the assumptions contained within environmental assessment processes. While SEIA has improved the consideration of environmental impacts, it remains dependent on technical expertise and institutional knowledge systems that privilege scientific and corporate assessments over Indigenous ecological knowledge.

The Escazú Agreement improves access to information and participation, but it does not fundamentally transform whose knowledge is considered authoritative or who determines acceptable levels of environmental change.

Distributional Justice: regulating harm rather than preventing sacrifice zones

The limitations are perhaps most visible in relation to distributional justice. Environmental assessments such as SEIA are useful regulatory tools because they identify potential impacts and establish mitigation requirements. However, they are primarily designed to assess individual projects rather than address cumulative ecological pressures or broader questions of how environmental benefits and burdens are distributed.

This creates a significant gap between regulatory approval and environmental justice. A project may comply with legal requirements while still producing socially contested outcomes. The concept of sacrifice zones highlights this limitation. There is no legal framework that explicitly permits the creation of sacrifice zones, but equally there is no comprehensive legal protection preventing communities from becoming disproportionately exposed to the environmental costs of national or global development strategies. The closest protection is the emerging recognition of the right to a clean, healthy and sustainable environment. This right represents an important normative shift by recognising that environmental integrity underpins the enjoyment of human rights, particularly for communities whose livelihoods and cultures are deeply connected to ecosystems.

However, despite its growing recognition, this right has not yet fundamentally constrained lithium extraction or prevented ecological degradation in the Salar de Atacama. Instead, environmental rights have primarily strengthened procedural expectations rather than established enforceable limits on extraction itself. This raises a broader question about whether current legal

frameworks are capable of preventing green sacrifice zones where decarbonisation objectives continue to prioritise mineral extraction.

The persistence of sacrifice zones demonstrates the difference between formal equality before the law and substantive environmental justice. While legal frameworks may recognise that everyone possesses a right to a healthy environment, economic development objectives continue to create flexibility where environmental harms are justified as necessary for broader societal goals. The same tension is now visible within the green transition, where activities framed as necessary for climate mitigation may reproduce patterns of environmental inequality historically associated with fossil fuel extraction.

6.2.3 International Governance Gaps and the Challenge of a Just Transition

A further limitation is that existing international legal frameworks were not designed specifically for the contemporary context of critical mineral extraction. ILO Convention 169 predates the lithium and electric vehicle boom by decades, while UNDRIP and other Indigenous rights instruments were not developed with energy-transition mineral demand in mind. As a result, existing standards are being retrofitted onto a rapidly expanding extractive sector characterised by new challenges, including water-intensive brine extraction in fragile desert ecosystems.

Furthermore, international climate governance and human rights governance remain largely separate systems. The Paris Agreement acknowledges the importance of human rights in climate action, but does not create binding obligations requiring states to ensure that decarbonisation strategies comply with environmental justice principles. Conversely, human rights institutions increasingly recognise climate change as a driver of rights violations, but lack direct authority over climate policy decisions. This creates an accountability gap where human rights impacts arising specifically from climate transition strategies remain difficult to challenge.

One explanation for this gap is the perceived tension between human rights protections and the urgency of climate action. Stronger requirements for Indigenous consent, for example, could potentially delay or prevent extraction of minerals considered essential for renewable energy technologies. Some policymakers and scholars therefore argue that flexibility is necessary to ensure a rapid transition away from fossil fuels. However, others argue that this framing falsely presents climate action and human rights as competing objectives. As Boyd argues, a transition that undermines fundamental rights risks reproducing the very inequalities that environmental justice seeks to address.³⁷⁵

³⁷⁵ United Nations Human Rights Council, Visit to Chile: Report of the Special Rapporteur on the Issue of Human Rights Obligations Relating to the Enjoyment of a Safe, Clean, Healthy and Sustainable Environment, David R. Boyd, UN Doc A/HRC/55/43/Add.1 (3 January 2024) paras 44–48, 83–86

Similarly, scholars have argued that climate governance has frequently prioritised technological solutions, market mechanisms and economic growth over questions of equity and justice. Within this context, weakening human rights protections to accelerate mineral extraction risks creating a transition that is environmentally sustainable in its objectives but unjust in its implementation.

Overall, existing legal frameworks have advanced environmental justice by creating important protections for Indigenous participation, improving transparency and strengthening environmental governance. They represent a significant improvement compared with earlier extractive governance models. However, they remain insufficient to deliver a genuinely just transition because they primarily operate within, rather than challenge, the political economy of extraction.

Chile's resource nationalist approach has strengthened state control and value capture, but it has not transformed the underlying power relations that determine whose interests shape lithium development. Consequently, injustice in the Salar de Atacama demonstrates the limits of legal reform when extraction remains structurally prioritised as necessary for economic development and global decarbonisation. A just transition therefore requires not only stronger legal protections, but a deeper reconsideration of who decides, who benefits and who bears the costs of the transition itself.

6.3 Recommendations for Governance

The analysis demonstrates that existing legal frameworks have generated important advances in Indigenous recognition, environmental governance and public participation. However, they remain insufficient to deliver environmental justice because they primarily regulate the impacts of extraction rather than transform the distribution of power, authority and environmental risk. A just transition therefore requires moving beyond managing extraction towards governance systems that embed human rights, ecological limits and meaningful community authority at the centre of decision-making.

Establishing binding corporate accountability for transition minerals

A first priority should be the adoption of a binding UN treaty on business and human rights, incorporating a specific annex addressing extractive industries within the climate transition. Existing frameworks, including the UN Guiding Principles on Business and Human Rights, provide important standards but remain voluntary and lack effective enforcement mechanisms. This creates a significant accountability gap in global mineral supply chains, where corporations benefit from transition demand while environmental and social costs are concentrated locally.

A minerals-specific framework should establish binding obligations relating to Indigenous rights, cumulative environmental impacts and corporate responsibility throughout supply chains. This is particularly important because existing legal instruments were not developed for the contemporary expansion of critical mineral extraction and are being applied retrospectively to a rapidly changing sector.

Strengthening FPIC and moving beyond consultation

The most urgent procedural reform is closing the gap between consultation and consent. As demonstrated in the Salar de Atacama, ILO Convention 169 has strengthened Indigenous participation but does not provide communities with a decisive role in extraction decisions. International standards, including UNDRIP, ILO 169 and the UN Principles to Guide the Critical Mineral Transition, increasingly recognise free, prior and informed consent (FPIC) as essential to respecting Indigenous peoples as rights holders rather than merely stakeholders.

A stronger framework should therefore require consent for projects affecting Indigenous territories, rather than relying primarily on consultation. This would address the current situation where communities can participate in decision-making processes but ultimately lack authority over whether extraction proceeds.

However, meaningful FPIC requires more than stronger legal wording. Current consultation processes often reproduce power inequalities because corporations and states define the terms of engagement. As Deva and Anand argue, a more transformative approach would reverse this relationship by allowing rights holders to design and control consultation processes, with companies participating within frameworks established by communities themselves. This would shift consultation from a procedural obligation towards genuine Indigenous self-determination.

Recognising Indigenous governance and knowledge systems

Strengthening procedural rights must also involve a deeper approach to recognitional justice. Existing frameworks increasingly recognise Indigenous identity and cultural rights, but often stop short of recognising Indigenous peoples as governance actors with legitimate authority over their territories. As Anaya argues, Indigenous peoples' rights are fundamentally connected to self-determination, not simply participation within state-defined processes.

Future governance models should therefore move towards co-governance arrangements where Indigenous governance systems and ecological knowledge are recognised as equally legitimate alongside state institutions and scientific expertise. This is particularly important in contexts such as the Salar de Atacama, where Indigenous relationships with water and ecosystems extend beyond the technical categories used within environmental assessment processes.

Establishing ecological limits and cumulative impact governance

A further reform is moving beyond project-based environmental assessment towards governance frameworks capable of addressing cumulative ecological harm. Current systems such as SEIA are valuable for identifying individual project impacts, but they are less capable of assessing whether the overall scale of extraction is compatible with ecological integrity.

Future frameworks should incorporate legally enforceable ecological limits, particularly in fragile ecosystems where scientific uncertainty remains significant. Independent hydrological monitoring should replace systems where companies are central producers of knowledge about their own environmental impacts. Monitoring should also integrate Indigenous ecological knowledge alongside Western scientific methodologies.

This reflects Funtowicz and Ravetz's concept of "post-normal science", which argues that where decisions involve uncertainty, complexity and high stakes, knowledge production should involve an "extended peer community" rather than relying exclusively on technical experts. Such an approach would create more legitimate and democratic environmental governance.

Ensuring distributional justice through benefit sharing and rights-based climate governance

Addressing distributional injustice requires moving beyond compensation towards meaningful benefit-sharing arrangements negotiated with affected communities. Although Chile's resource nationalist approach has increased state involvement and value capture, communities closest to extraction continue to experience environmental risks without equivalent decision-making power.

Benefit-sharing mechanisms should therefore be developed collaboratively with communities and recognise that financial compensation cannot substitute for ecological degradation or loss of territorial authority. Communities should be treated as partners in governance rather than recipients of economic benefits.

More broadly, climate policy requires a rights-based approach that ensures vulnerable communities do not bear disproportionate costs in the transition. As Boyd argues, climate action and human rights should not be framed as competing objectives. Similarly, Gonzalez highlights that climate governance has often prioritised economic growth and market-based solutions over questions of justice and equity. A genuinely just transition must therefore ensure that decarbonisation does not reproduce the inequalities associated with previous extractive systems.

Creating stronger international accountability mechanisms

Finally, the fragmentation between climate governance, human rights governance and extractive regulation requires institutional reform. One potential approach would be a new international body under joint UNEP and Human Rights Council oversight with a mandate to assess cumulative harms within transition mineral supply chains. Crucially, this mechanism should allow affected communities to trigger investigations directly rather than relying solely on states.

Such an institution would address a key weakness in the current system: although international frameworks recognise environmental and Indigenous rights, enforcement remains fragmented and dependent on domestic political will.

Realising the right to a clean, healthy and sustainable environment also requires an ecosystemic approach to governance. As Bastida argues, environmental rule of law requires redesigning legal institutions so that decisions balance development objectives with ecological integrity and meaningful participation.³⁷⁶ This represents a shift from viewing environmental protection as a procedural requirement towards understanding it as a fundamental condition of legitimate governance.

The reforms required for a just transition therefore extend beyond strengthening existing legal protections. While consultation rights, environmental assessments and corporate responsibilities are important advances, they remain insufficient without a redistribution of decision-making authority and recognition of ecological limits. The challenge is not simply making extraction more sustainable, but transforming the legal and institutional structures that determine who decides, who benefits and who bears the costs of the transition. Without such transformation, green extractivism risks reproducing existing patterns of inequality under the justification of climate action.

Chapter 7 - Discussion

7.1 Introduction

The Analysis demonstrated that Chile's transition towards greater state involvement in lithium mining has improved environmental regulation and expanded opportunities for Indigenous participation. However, environmental conflicts and inequalities continue. This chapter considers what these findings reveal about the relationship between “green” extractivism, governance and environmental justice. It argues that while governance reforms have made efforts to change the

³⁷⁶ Ana Elizabeth Bastida, ‘Redesigning Mineral Regimes to Strengthen the Environmental Rule of Law: A Case Study on Lithium in Brines’ (2024) 33 *Review of European, Comparative & International Environmental Law* 633, 643–45.

management of lithium extraction, they are restricted in the capacity to reconcile increasing demands for lithium on the world market with the principles of environmental justice.

7.2 Has the move towards Resource Nationalism Improved National Development in Chile?

The findings indicate that Chile's shift towards resource nationalism has strengthened some opportunities for justice compared with the previous neoliberal model.³⁷⁷ Through the renegotiation of contracts with SQM and Albemarle, the introduction of progressive royalty arrangements and the National Lithium Strategy, Chile has increased state revenues and opened doors to shaping the future of the lithium sector.³⁷⁸ These reforms demonstrate that governance choices can influence how the benefits of extraction are distributed, supporting resource nationalist arguments advanced by scholars such as Mazzucato and Stevens.³⁷⁹

While the state now retains a larger share of mining revenues, it is still the higher-value activities such as battery manufacturing and technological innovations that currently take place outside Chile.³⁸⁰ As a result, the country continues to occupy a predominantly upstream position within global lithium supply chains.³⁸¹ This reflects many of the structural constraints and issues identified by supply-chain theorists.³⁸²

While Chile has demonstrated that governance reforms can influence the developmental outcomes of extraction and exert limited controls on privately-held companies, the following sections examine whether these same reforms have been equally successful in advancing environmental justice.

7.3 Governance Law and Environmental Justice

The analysis demonstrates that Chile's evolving legal and governance framework has produced meaningful improvements across the three dimensions of environmental justice. Stronger environmental regulation, expanded Indigenous consultation and increased state oversight have created a more accountable governance system than that which existed under earlier neoliberal approaches. These developments suggest that legal reform has been effective in improving the

³⁷⁷ Mazzucato (n69)

³⁷⁸ Corporación de Fomento de la Producción (CORFO), Agreement between CORFO and SQM Salar SA (2018).

³⁷⁹ Mariana Mazzucato, (n69)

³⁸⁰ International Energy Agency, Global Supply Chains of EV Batteries (IEA 2022) 92–103.

³⁸¹ *ibid.*

³⁸² Raúl Prebisch, The Economic Development of Latin America and its Principal Problems (ECLAC 1950) 1–15.

governance of lithium extraction, highlighting some of its most significant injustices and corrupt practices.

However, the findings also demonstrate that these improvements have been uneven and not especially effective. Procedural justice has advanced most significantly through the institutionalisation of consultation processes and shone a light on the need for transparency, yet Indigenous communities continue to exert only limited influence over strategic decisions concerning whether and how extraction proceeds.³⁸³ Similarly, while recognitional justice has improved through greater acknowledgement of Indigenous rights, state institutions and the private operators, Albemarle and SQM, continue to define the legal and scientific frameworks within which Indigenous knowledge and lived experiences are recognised.³⁸⁴ Distributional inequalities also remain, with environmental risks requiring much greater degrees of state-led intervention if future outcomes for biodiversity and other environmental factors are to be predicted.³⁸⁵ As long as expanding extraction remains central to both economic development and climate policy, governance reforms alone are unlikely to remove the tensions between decarbonisation and ecological protection.

7.4 Rethinking Green Extractivism: Lessons from the Salar de Atacama

The Chilean case offers many insights into contemporary debates surrounding green extractivism and the pursuit of a 'just transition.' Green growth narratives present critical minerals such as lithium as an environmental necessity, enabling the decarbonisation required to meet international climate commitments.³⁸⁶ While the findings of this thesis do not challenge the importance of critical minerals in reducing reliance on fossil fuels, they do demonstrate that decarbonisation cannot be equated with environmental justice and the opposite may apply.³⁸⁷ The purpose of extraction has changed, but many of the inequalities associated with extractive development remain.

Critics of green extractivism argue that the green transition can reproduce historical patterns of resource extraction and colonialism under a new environmental rationale.³⁸⁸ The transition

³⁸³ Thea Riofrancos, *Resource Radicals: From Petro-Nationalism to Post-Extractivism in Ecuador* (Duke University Press 2020) 156–165.

³⁸⁴ David Schlosberg, *Defining Environmental Justice* (Oxford University Press 2007) 13–18.

³⁸⁵ Benjamin K Sovacool and others, 'Sustainable Minerals and Metals for a Low-Carbon Future' (2020) 367 *Science* 30, 30–33.

³⁸⁶ Organisation for Economic Co-operation and Development (OECD), *Towards Green Growth* (OECD Publishing 2011) 9–24.

³⁸⁷ International Energy Agency, *The Role of Critical Minerals in Clean Energy Transitions* (IEA 2021) 21–39.

³⁸⁸ Eduardo Gudynas, 'Extractivisms: Tendencies and Consequences' in Ronaldo Munck and Raúl Delgado Wise (eds), *Reframing Latin American Development* (Routledge 2018) 61–74.

towards renewable energy therefore requires not only technological change but also continued attention to questions of justice, power and governance.³⁸⁹

These findings also contribute to debates surrounding radical resource nationalism. Riofrancos argues that achieving a more just form of extraction requires moving beyond greater state ownership. She proposes “democratic control over natural resources”, where decisions about how raw materials are extracted, processed and use are made collectively by the people, rather than by private corporations, state ‘elites’ or global capitalist markets. Local sovereignty and what she terms “true democracy” require economic and environmental freedom and the power to say “No”.³⁹⁰ Strengthening co-governance and community decision-making would be an important step beyond conventional resource nationalism.

Research suggests that existing legal frameworks are more effective at improving the conditions under which extraction takes place, and much less focussed on the scales of power that can tip whole communities into environmental injustice. Instruments such as ILO Convention 169, UNDRIP and the Escazú Agreement have strengthened participation, transparency and accountability, but they have not fundamentally redistributed decision-making with respect to lithium mining development and its impacts.³⁹¹

Riofrancos observes that whilst anti-extractivist scholarship has been highly effective at exposing the environmental and social injustices associated with extractive development, it has been considerably less successful in articulating politically and economically viable alternatives to resource-dependent economies.³⁹² Questions surrounding how states would replace mining revenues, what industries could substitute mineral exports, how future energy demands would be met, and how producer countries could participate in the global economy remain only partially answered. The findings of this thesis reinforce the importance of these debates. Whilst existing legal frameworks can improve the conditions under which extraction occurs, they appear far less capable of addressing the structural political and economic forces that continue to drive expanding demand for critical minerals.

Chile's legal reforms have undoubtedly delivered tangible improvements, for instance in access to information and share of voice. However, many of these processes are not protected by law and the deep, structural inequalities that exist in the Salar de Atacama region suggests that legal reform alone is unlikely to eliminate the tensions between economic development, Indigenous

³⁸⁹ David Schlosberg, *Defining Environmental Justice* (Oxford University Press 2007) 13–24.

³⁹⁰ Riofrancos (n209)

³⁹¹ FIDH, *Chile and the Indigenous Peoples* 108–109.

³⁹² Riofrancos (n209)

rights, and ecological protection. The fragmented frameworks and pressures from the Global North's consumer and corporate markets are creating and compounding a wide range of issues.

7.5 The Limits of Governance within an Extractive Economy

The findings of this thesis show that the challenges associated with lithium extraction in Chile are not solely the result of weak national governance or inadequate legal frameworks. Rather, they reflect the structural tensions that emerge when an economic model continues to depend upon expanding resource extraction.³⁹³ While Chile has strengthened environmental regulation, increased state involvement, and broadened the opportunities for Indigenous people's participation, these reforms have not eliminated the conflicts associated with lithium development in the Salar de Atacama. The scale of extraction and the question as to whether particular projects are compatible with environmental justice in the first place have been subjugated to the demand for critical minerals.³⁹⁴

This suggests that governance has become increasingly effective at regulating extraction, but considerably less effective at determining its ecological limits. Existing legal frameworks largely focus on improving extraction through environmental assessment.³⁹⁵ Research therefore indicates that governance reform cannot be viewed as a complete solution to environmental justice conflicts. Radical resource nationalism could strengthen democratic participation and redistribute wealth and economic power.³⁹⁶ Nevertheless, the inherent and increasing demands for 'net zero' solutions within a global political economy will remain the key factors.

Chapter 8 - Conclusion

This dissertation set out to examine how environmental justice is shaped by the governance of critical mineral extraction, using lithium mining in Chile's Salar de Atacama as a case study. It sought to move beyond debates that present the green transition as either an environmental necessity or an inevitable form of green extractivism, instead examining how governance mediates the tensions between decarbonisation, resource extraction and environmental justice. The findings demonstrate that governance matters. Chile's evolving governance framework has improved important aspects of distributive, procedural and recognitional justice, yet these reforms have not demonstrated that they are capable of fully reconciling environmental justice with an expanding extractive economy. Rather than resolving these tensions, governance has simply mediated them.

³⁹³ Gudynas (n38)

³⁹⁴ Gudynas (n38)

³⁹⁵ Gudynas (n38)

³⁹⁶ Riofrancos (n49).

The research first examined how the governance of lithium extraction has evolved in Chile. It identified a gradual shift away from the neoliberal governance model established under the Pinochet regime towards greater state coordination, oversight and public participation. Institutions such as CORFO, the Environmental Superintendence (SMA) and, more recently, the National Lithium Strategy have expanded the state's role in regulating lithium extraction, strengthening environmental monitoring, increasing transparency and seeking to ensure that a greater proportion of the benefits generated by lithium contribute to national development. At the same time, governance has become increasingly multi-level, operating through an interconnected network of state institutions, international legal obligations and private corporate commitments. Yet despite these changes, the fundamental purpose of governance has remained largely unchanged. Existing institutions are principally designed to regulate extraction more responsibly, improve benefit sharing and mitigate environmental harm, rather than determine whether particular forms or scales of extraction are themselves compatible with environmental justice.

Improvements have been evident across distributive, procedural and recognitional dimensions of justice. Greater public oversight, stronger environmental regulation and revenue-sharing mechanisms have improved accountability, while legal obligations arising from instruments such as ILO Convention No. 169 have expanded opportunities for Indigenous consultation and participation. However, these gains remain uneven. Indigenous communities continue to bear a disproportionate share of the environmental costs through water depletion, ecological transformation and changes to traditional livelihoods, whilst many of the economic and strategic benefits of lithium extraction are distributed nationally and globally through critical mineral supply chains. Procedural rights have expanded, but consultation has not necessarily translated into meaningful shared decision-making, and Indigenous knowledge continues to compete with technical, scientific and economic forms of 'expertise'. The central question therefore becomes not only whether Indigenous worldviews are recognised within governance frameworks, but whose worldview ultimately determines which forms of development are considered legitimate, whose knowledge is valued, and who has the authority to define and accept the environmental consequences of extraction.

The analysis of domestic and international legal frameworks further reinforces these findings. Rather than operating through a single coherent framework for environmental justice, governance in Chile is shaped by a fragmented network of constitutional principles, environmental legislation, Indigenous rights, international human rights obligations and voluntary corporate standards. Collectively, these frameworks have strengthened environmental protection, recognised important procedural rights and created new mechanisms through which affected communities can challenge environmental harm. However, fragmentation across legal regimes, overlapping institutional mandates and inconsistent implementation frequently weaken their effectiveness in practice. Litigation remains lengthy and resource-intensive, environmental monitoring continues to rely heavily upon corporate self-reporting, and significant asymmetries

of information and power persist between the state, corporations and Indigenous communities. As this research has shown, legal frameworks are essential to improving governance, but they cannot, on their own, overcome the broader structural conditions within which governance operates.

This leads directly to the principal finding of the dissertation. Environmental justice has largely been incorporated into extractive governance as a means of improving how extraction is managed, rather than as a framework for determining its ecological and political limits. Existing governance arrangements have become increasingly effective at regulating extraction through environmental assessment, consultation, monitoring and accountability. They have been considerably less effective at addressing more fundamental questions concerning the appropriate scale of extraction, the ecological limits of the Salar de Atacama, or whether expanding lithium production is itself compatible with environmental justice.

The research also sought to identify what continues to limit environmental justice outcomes under the current governance model and how these limitations might be addressed. The findings suggest that many of these limitations are not simply institutional shortcomings, but structural constraints embedded within the political economy of the green transition itself. Chile's governance framework operates within competing imperatives: protecting fragile ecosystems, respecting Indigenous rights, promoting national economic development and securing the critical minerals required for global decarbonisation. Strengthening environmental assessment, independent scientific monitoring, transparency, corporate accountability and meaningful Indigenous participation would undoubtedly improve environmental justice outcomes and should remain central policy priorities. Equally important is reducing fragmentation between legal frameworks and institutions so that environmental governance functions as a more coherent and coordinated system rather than a collection of overlapping obligations with inconsistent implementation. However, governance reforms alone cannot fully resolve the tensions created by an economic model that continues to depend upon expanding extraction.

This is particularly evident when considering alternative governance models. The thesis explored whether radical resource nationalism could move Chile closer to environmental justice than existing arrangements. Greater state ownership, stronger public institutions and more equitable distribution of extractive revenues may indeed produce fairer outcomes than previous neoliberal approaches and strengthen democratic control over natural resources. However, even these models remain embedded within global markets, patterns of consumption and economic incentives that continue to reward increased extraction. The Chilean state's dual role as both regulator and promoter of lithium development exemplifies this structural bind. Radical resource nationalism may therefore move further towards environmental justice than existing governance arrangements, but it cannot, by itself, resolve the broader political economy of green extractivism.

The principal contribution of this dissertation is therefore not simply to assess Chile's governance framework, but to bridge environmental justice scholarship with debates on green extractivism and critical mineral governance. Rather than treating governance as either the solution to, or the cause of, environmental injustice, the research demonstrates that governance and environmental justice should be understood as interconnected analytical lenses. Applying an environmental justice framework reveals both the improvements that governance reforms can deliver and the structural political-economic constraints that limit what governance can ultimately achieve. In doing so, the dissertation contributes to a growing body of scholarship that seeks to understand not only how critical minerals are governed, but also the conditions under which governance can produce more just outcomes.

The implications extend well beyond Chile. As nations increasingly compete to secure critical mineral supplies for the green transition, there is a risk that environmental justice becomes reduced to a question of procedural improvement rather than a broader consideration of the ecological and political limits of extraction. Comparative research across other critical mineral producing regions would further illuminate how different governance models and political economies shape environmental justice outcomes and whether alternative approaches can move beyond managing extraction towards genuinely transforming it.

Ultimately, the Salar de Atacama demonstrates that the central challenge of the green transition is not simply how critical minerals should be governed, but how environmental justice is shaped by the political and economic structures within which governance operates. Chile shows that governance reforms can make critical mineral extraction significantly more just by improving accountability, participation and legal protection. However, it also demonstrates that existing governance models have not yet shown themselves capable of fully reconciling environmental justice with an expanding extractive economy. A truly just transition will therefore require more than cleaner technologies or stronger regulation. It will require continued efforts to transform the political, legal and economic arrangements through which the foundations of the green transition are produced.

Bibliography

Primary Sources

International Instruments

International Labour Organization. Indigenous and Tribal Peoples Convention (No 169) (adopted 27 June 1989, entered into force 5 September 1991) 1650 UNTS 383.

Paris Agreement (adopted 12 December 2015, entered into force 4 November 2016) TIAS No 16-1104.

Regional Agreement on Access to Information, Public Participation and Justice in Environmental Matters in Latin America and the Caribbean (adopted 4 March 2018, entered into force 22 April 2021).

UN Declarations and Resolutions

Declaration of the United Nations Conference on the Human Environment (Stockholm Declaration), UN Doc A/CONF.48/14/Rev.1 (16 June 1972).

United Nations Framework Convention on Climate Change (adopted 9 May 1992, entered into force 21 March 1994) 1771 UNTS 107.

United Nations General Assembly, United Nations Declaration on the Rights of Indigenous Peoples GA Res 61/295 (13 September 2007)

United Nations Declaration on the Rights of Indigenous Peoples, GA Res 61/295, UNGAOR, 61st Sess, Supp No 49, UN Doc A/RES/61/295 (13 September 2007).

Domestic Legislation

Código de Aguas (Chile), Decreto con Fuerza de Ley No 1122, Diario Oficial, 29 October 1981.

Código de Minería (Chile), Ley No 18.248, Diario Oficial, 14 October 1983.

Decreto Ley No 2886, Diario Oficial, 14 November 1979

Decreto Supremo No 40/2012 del Ministerio del Medio Ambiente, Reglamento del Sistema de Evaluación de Impacto Ambiental (Chile).

Decreto Supremo No 66/2013 del Ministerio de Desarrollo Social, Reglamento que Regula el Procedimiento de Consulta Indígena (Chile)

Law No 19.300 on General Bases of the Environment (Chile, 1994).

Law No 20.417 Creating the Ministry of the Environment, the Environmental Assessment Service and the Superintendence of the Environment (Chile, 2010).

Law No 20.600 Establishing Environmental Courts (Chile, 2012).

Ley sobre Bases Generales del Medio Ambiente (Chile) Ley No 19.300, Diario Oficial, 9 March 1994.

Ministry of the Environment (Chile), Regulation of the Environmental Impact Assessment System (Supreme Decree No 40, 2012).

Reglamento del Sistema de Evaluación de Impacto Ambiental (Chile) Decreto Supremo No 40, Ministerio del Medio Ambiente, Diario Oficial, 12 August 2013.

Reglamento que Regula el Procedimiento de Consulta Indígena en virtud del artículo 6 No 1 letra a) y No 2 del Convenio No 169 de la Organización Internacional del Trabajo (Chile) Decreto Supremo No 66, Ministerio de Desarrollo Social, Diario Oficial, 4 March 2014.

Government Agency

Comisión Chilena del Cobre (COCHILCO), Lithium in Chile (latest edn).

Corporación de Fomento de la Producción (CORFO), Contrato de Arrendamiento Proyecto Salar de Atacama (2018).

Corporación de Fomento de la Producción (CORFO), CORFO and Albemarle Sign New Agreement for the Exploitation of Lithium in the Salar de Atacama (2016).

Superintendencia del Medio Ambiente, Resolución Exenta No 38/ROL F-041-2016, ‘Aprueba Programa de Cumplimiento presentado por SQM Salar SA y suspende procedimiento administrativo sancionatorio’ (29 August 2022); Superintendencia del Medio Ambiente, ‘SMA aprueba programa de cumplimiento que exige a SQM Salar medidas por más de 46.000 millones de pesos’ (30 August 2022)

<https://portal.sma.gob.cl/index.php/sma-aprueba-programa-de-cumplimiento-que-exige-a-sqm-salar-medidas-por-mas-de-46-000-millones-de-pesos/> accessed 24 July 2026.

Corporate and Government Documents

Albemarle Corporation and Corporación de Fomento de la Producción (CORFO), 'Albemarle and CORFO Announce Resolution in Chile' (24 January 2019) available at: <https://www.albemarle.com/us/en/news/albemarle-and-corfo-announce-resolution-chile> accessed 23 July 2026.

Codelco and SQM, Memorandum of Understanding (2023).

Corporación Nacional del Cobre de Chile, 'Comunidades Indígenas Atacameñas, Codelco y SQM acuerdan constituir Mesa de diálogo en el marco de la Estrategia Nacional del Litio' (15 December 2023) <https://www.codelco.com/comunidades-indigenas-atacamenas-codelco-y-sqm-acuerdan-constituir-mesa> accessed 24 July 2026; Sociedad Química y Minera de Chile SA, 'SQM Announces a

Memorandum of Understanding with Codelco' (27 December 2023) https://www.sec.gov/Archives/edgar/data/909037/000090903723000076/a6_kxcodelcoxmoux27dec2023.htm accessed 24 July 2026.

Comisión Nacional del Litio, *Informe Comisión Nacional del Litio* (Ministerio de Minería 2015).

CORFO, *Contrato de Arrendamiento Proyecto Salar de Atacama* (amended 2018).

CORFO, *Contrato Especial de Operación del Litio* (amended 2016).

Corporación de Fomento de la Producción (CORFO), 'Arbitration Proceeding with CORFO' (23 May 2016) available at: https://sqm.com/en/noticia_i/arbitraje-corfo/ accessed 23 July 2026.

Corporación de Fomento de la Producción (CORFO), Agreement between CORFO and SQM Salar SA (2018). <https://www.corfo.cl>

Corporación de Fomento de la Producción (CORFO), Consulta Indígena sobre el mecanismo de distribución de aportes del Convenio CORFO–SQM Salar (2024) https://www.corfo.cl/sites/cpp/consulta_indigena_salar_atacama accessed 23 July 2026.

Decreto Supremo No 60, Ministerio de Minería (2014).

Dirección General de Aguas, Resolución DGA N° 44, de 13 de mayo de 2016, que declara el agotamiento de la cuenca del Río San Pedro y sus afluentes, Provincia de El Loa, Región de Antofagasta <https://www.bcn.cl/leychile/navegar?idNorma=1092006> accessed 23 July 2026.

Dirección General de Aguas, Resolución DGA N° 3, de 12 de abril de 2017, que declara el agotamiento de la cuenca del Río Vilama y sus afluentes, Provincia de El Loa, Región de Antofagasta <https://www.bcn.cl/leychile/Navegar?idNorma=1103421> accessed 23 July 2026.

Gobierno de Chile, Estrategia Nacional del Litio (Gobierno de Chile 2023).

Government of Chile, Nationally Determined Contribution: Updated Nationally Determined Contribution 2020 (Ministry of the Environment 2020).

Government of Chile, National Lithium Strategy: For Chile and its People (Ministry of Mining 2023).

Servicio de Evaluación Ambiental (SEA), Sistema de Evaluación de Impacto Ambiental (SEIA) <https://www.sea.gob.cl> accessed 23 July 2026.

Servicio de Evaluación Ambiental, 'La Consulta Indígena en el SEIA' (Servicio de Evaluación Ambiental 2025) <https://sea.gob.cl/> accessed 23 July 2026.

Sociedad Química y Minera de Chile SA, 'SQM Announces Temporary Detention of Operations in Salar de Atacama' (13 January 2024) https://www.sec.gov/Archives/edgar/data/909037/000090903724000002/a6_kxsdaoperationsdetentionio.htm accessed 24 July 2026

Superintendencia del Medio Ambiente, Procedimiento Sancionatorio Rol F-018-2022: Albemarle Limitada (SNIFA Case File, initiated 9 March 2022) <https://snifa.sma.gob.cl/Sancionatorio/Ficha/2832> accessed 23 July 2026.

United Nations Human Rights Council, Visit to Chile: Report of the Special Rapporteur on the Issue of Human Rights Obligations Relating to the Enjoyment of a Safe, Clean, Healthy and Sustainable Environment, David R Boyd, UN Doc A/HRC/55/43/Add.1 (3 January 2024).

Cases

Comunidad Indígena Atacameña de Camar con Corporación de Fomento de la Producción (CORFO), Corte Suprema de Chile, Rol No 14.514-2021 (18 May 2022).

Comunidad Indígena Atacameña de Peine v Minera Escondida Ltda, First Environmental Court, Case D-12-2022, settlement approved 16 December 2024

Consejo de Defensa del Estado v Albemarle Ltda, Minera Escondida Ltda and Compañía Minera Zaldívar SpA, First Environmental Court of Antofagasta (settlement approved 2024).

Corte Suprema de Chile Rol No 23.566-2022 (2022).

First Environmental Court of Antofagasta, Complaints R-17-2019, R-18-2019 and R-19-2019 (26 December 2019).

First Environmental Court of Chile, Atacameña de Peine Indigenous Community and others v Superintendencia del Medio Ambiente, Rol R-16-2019, Judgment of 26 December 2019.

Primer Tribunal Ambiental de Antofagasta, Consejo de Defensa del Estado con Albemarle Ltda, Minera Escondida Ltda y Compañía Minera Zaldívar SpA, settlement approving agreement (2024).

Secondary Sources

Books

Amin S, *Accumulation on a World Scale: A Critique of the Theory of Underdevelopment* (Monthly Review Press 1974).

Auty RM, *Sustaining Development in Mineral Economies: The Resource Curse Thesis* (Routledge 1993).

Barca S, *Workers of the Earth: Labour, Ecology and Reproduction in the Age of Climate Change* (Pluto Press 2024).

Bebbington A and Bury J (eds), *Subterranean Struggles: New Dynamics of Mining, Oil, and Gas in Latin America* (University of Texas Press 2013).

Bullard RD, *Dumping in Dixie: Race, Class and Environmental Quality* (3rd edn, Westview Press 2000).

Cardoso FH and Faletto E, *Dependency and Development in Latin America* (University of California Press 1979).

- Coulthard GS, *Red Skin, White Masks: Rejecting the Colonial Politics of Recognition* (University of Minnesota Press 2014) 3–24.
- Fraser N, *Scales of Justice: Reimagining Political Space in a Globalizing World* (Polity Press 2008).
- Dunlap A and Jakobsen J, *The Violent Technologies of Extraction: Political Ecology, Critical Agrarian Studies and the Capitalist Worldeater* (Palgrave Macmillan 2020).
- Escobar A, *Territories of Difference: Place, Movements, Life, Redes* (Duke University Press 2008).
- Frank AG, *Capitalism and Underdevelopment in Latin America* (Monthly Review Press 1967).
- Furtado C, *Economic Development of Latin America* (Cambridge University Press 1970).
- Fraser N, *Justice Interruptus: Critical Reflections on the "Postsocialist" Condition* (Routledge 1997).
- Gomez-Barris M, *The Extractive Zone: Social Ecologies and Decolonial Perspectives* (Duke University Press 2017).
- Kaplinsky R and Morris M, *A Handbook for Value Chain Research* (Institute of Development Studies 2001).
- Martinez-Alier J, *The Environmentalism of the Poor: A Study of Ecological Conflicts and Valuation* (Edward Elgar 2002).
- Mazzucato M, *The Entrepreneurial State: Debunking Public vs Private Sector Myths* (Penguin Books 2018).
- Mazzucato M, *Mission Economy: A Moonshot Guide to Changing Capitalism* (Allen Lane 2021).
- Miranda Fricker, *Epistemic Injustice: Power and the Ethics of Knowing* (Oxford University Press 2007) 147–75.
- Moore JW, *Capitalism in the Web of Life: Ecology and the Accumulation of Capital* (Verso 2015).
- Newell P, *Power Shift: The Global Political Economy of Energy Transitions* (Cambridge University Press 2021).

Pellow DN, What Is Critical Environmental Justice? (Polity Press 2018).

Prebisch R, The Economic Development of Latin America and its Principal Problems (United Nations Economic Commission for Latin America 1950). Available at: <https://repositorio.cepal.org/items/c3d66c6e-4c7d-4f69-8fb2-c8908f0245c0>

Riofrancos T, Resource Radicals: From Petro-Nationalism to Post-Extractivism in Ecuador (Duke University Press 2020). Available at: <https://doi.org/10.1515/9781478012122>

Riofrancos T, Extraction: The Frontiers of Green Capitalism (Allen Lane 2025).

Schlosberg D, Defining Environmental Justice: Theories, Movements, and Nature (Oxford University Press 2007). Available at: <https://global.oup.com/academic/product/defining-environmental-justice-9780199286294>

Sheila Jasanoff, 'The Idiom of Co-production' in Sheila Jasanoff (ed), States of Knowledge: The Co-production of Science and Social Order (Routledge 2004) 1, 2–6.

Sovacool BK, The Routledge Handbook of Energy Security (Routledge 2011).

Sovacool BK and Dworkin MH, Global Energy Justice (Cambridge University Press 2015).
Sze J, Environmental Justice in a Moment of Danger (University of California Press 2020).

Suwandi I, Value Chains: The New Economic Imperialism (Monthly Review Press 2019).

Svampa M, Neo-Extractivism in Latin America: Socio-Environmental Conflicts, the Territorial Turn, and New Political Narratives (Cambridge University Press 2024).

Walker G, Environmental Justice: Concepts, Evidence and Politics (Routledge 2012).

Yergin D, The New Map: Energy, Climate, and the Clash of Nations (Penguin Books 2021).

Book Chapters

Gudynas E, 'Extractivisms: Tendencies and Consequences' in Ronaldo Munck and Raúl Delgado Wise (eds), Reframing Latin American Development (Routledge 2018) 61–76. DOI: <https://doi.org/10.4324/9781315170084-4>

Gudynas E, 'The New Extractivism of the 21st Century: Ten Urgent Theses about Extractivism in Relation to Current South American Progressivism' in Miriam Lang and Dunia Mokrani (eds),

Beyond Development: Alternative Visions from Latin America (Transnational Institute and Rosa Luxemburg Foundation 2011).

Whyte KP, 'Indigenous Environmental Justice: Anti-Colonial Action through Kinship' in Brendan Coolsaet (ed), *Environmental Justice: Key Issues* (Routledge 2020) 266

Journal Articles

Álvarez M and others, 'Lithium in Chile: Present Status and Future Outlook' (2024) *Materials Advances*.

Archer M and Calvão F, 'Sustaining Decarbonisation: Energy Storage, Green Extractivism, and the Future of Mining' (2025) *Antipode*.

Babidge S, 'Contested Value and an Ethics of Resources: Water, Mining and Indigenous People in the Atacama Desert, Chile' (2016) 22 *Australian Journal of Anthropology* 84.

Babidge S, 'Indigenous People, Mining and the Possibilities of Procedural Justice in Chile' (2019) *International Journal on Minority and Group Rights*.

Bastida AE, 'Redesigning Mineral Regimes to Strengthen the Environmental Rule of Law: A Case Study on Lithium in Brines' (2024) *Review of European, Comparative & International Environmental Law*. 633-646.

Bebbington A, Hinojosa L, Humphreys Bebbington D, Burneo ML and Warnars X, 'Mining and Social Movements: Struggles Over Livelihood and Rural Territorial Development in the Andes' (2008) 39(6) *Development and Change* 887–914.

Borrows J, 'Indigenous Legal Traditions in Canada' (2005) 19 *Washington University Journal of Law & Policy* 167

Bridge G and Gailing L, 'New Energy Spaces: Towards a Geographical Political Economy of Energy Transition' (2020) 52 *Environment and Planning A: Economy and Space* 1037–1050

Buu-Sao D, Chailleux S and Le Berre S, 'Ecological Crisis and Green Capitalism: Toward a Climatization of Extractive Industries?' (2024) 105(1) *Review of Agricultural, Food and Environmental Studies* 17–43.

Cabello J, 'Lithium Brine Production, Reserves, Resources and Exploration in Chile: An Updated Review' (2021) 145 *Ore Geology Reviews* 104803.

Chagnon A and others, 'Chile's Lithium Exceptionalism: Strategic Legacies and the Contested Future of the Salar de Maricunga' (2025) *The Extractive Industries and Society*.

Chagnon C, Durante F, Gills BK, Hagolani-Albov SE, Hokkanen J, Ince B, et al, 'From Extractivism to Global Extractivism: The Evolution of an Organizing Concept' (2022) 29(1) *Journal of Political Ecology* 760–792.

Cuppen E, 'The Value of Social Conflicts: Critiquing Invited Participation in Energy Projects' (2018) 38 *Energy Research & Social Science* 28

Deva S and Anand P, 'A Global South Perspective on Labour Rights and Supply Chains for a Post-Growth World' in Nicolas Bueno, Beryl ter Haar and Nuna Zekić (eds), *Labour Law Utopias* (Oxford University Press 2024).

Dorn FM and Gundermann H, 'Mining Companies, Indigenous Communities, and the State: The Political Ecology of Lithium in Chile (Salar de Atacama) and Argentina (Salar de Olaroz-Cauchari)' (2022) 29 *Journal of Political Ecology* 341.

Dorn FM, Hafner R and Plank C, 'Towards a Climate Change Consensus: How Mining and Agriculture Legitimize Green Extractivism in Argentina' (2022) 11 *The Extractive Industries and Society* 101130.

Dunlap A and Laratte L, 'European Green Deal Necropolitics: Exploring "Green" Energy Transition, Degrowth, and Infrastructural Colonization' (2022) 97 *Political Geography* 102640.

Dunlap A and Riquito M, 'Social Warfare for Lithium Extraction? Open-Pit Lithium Mining, Counterinsurgency Tactics and Enforcing Green Extractivism in Northern Portugal' (2023) 95 *Energy Research & Social Science* 102912

Dunlap A, *Love the State, but Hate (Neo)Colonialism? Discussing Sacrifice Zones and (Green) Colonialism in Political Ecology* (2026).

Dunlap A, Verweijen J and Tornel C, 'The Political Ecologies of "Green" Extractivism(s): An Introduction' (2024) 31(1) *Journal of Political Ecology* 436–463.

Fraser N, 'Rethinking Recognition' (2000) 3 *New Left Review* 107.

Funtowicz SO and Ravetz JR, 'Science for the Post-Normal Age' (1993) 25(7) *Futures* 739–755 <https://www.sciencedirect.com/science/article/abs/pii/001632879390022L> accessed 21 July 2026.

Geels FW, 'Socio-technical Transitions to Sustainability: A Review of Criticisms and Elaborations of the Multi-Level Perspective' (2019) *Current Opinion in Environmental Sustainability*.

Geels FW, Berkhout F and Van Vuuren DP, 'Bridging Analytical Approaches for Low-Carbon Transitions' (2016) 6 *Nature Climate Change* 576–583.

Gereffi G, Humphrey J and Sturgeon T, 'The Governance of Global Value Chains' (2005) 12(1) *Review of International Political Economy* 78–104. <https://doi.org/10.1080/09692290500049805>

Gundermann H and Göbel B, 'Comunidades indígenas, empresas del litio y sus relaciones en el Salar de Atacama' (2018) 50(3) *Chungará: Revista de Antropología Chilena* 471.

Guzmán J and others, 'Evolution of the Surface Area of Critical Lagoon Systems in the Salar de Atacama' (2022) *Remote Sensing* [verify volume, issue and article number].

Jerez B, Garcés I and Torres R, 'Lithium Extractivism and Water Injustices in the Salar de Atacama, Chile: The Colonial Shadow of Green Electromobility' (2021) 87 *Political Geography* 102382.

Lorca M, Olivera Andrade M, Escosteguy M, Köppel J, Scoville-Simonds M and Hufty M, 'Mining Indigenous Territories: Consensus, Tensions and Ambivalences in the Salar de Atacama' (2022) 9 *The Extractive Industries and Society* 101047.

Lorca M, Olivera Andrade M and Garcés I, "“Se instaló el diablo en el Salar”. Organizaciones atacameñas, agua y minería del litio en el Salar de Atacama' (2023) 69 *Estudios Atacameños* e4899.

Marazuela MA, Vázquez-Suñé E, Ayora C and García-Gil A, 'Towards More Sustainable Brine Extraction in Salt Flats: Learning from the Salar de Atacama' (2020) 703 *Science of the Total Environment* 135605.

Mol APJ and Spaargaren G, 'Ecological Modernization Theory in Debate: A Review' (2000) 9 *Environmental Politics* 17.

- Morales H, 'Génesis, Formación y Desarrollo del Movimiento Atacameño (Norte de Chile)' (2014) 49 Estudios Atacameños 11.
- Morales H and Azócar R, 'Minería y Relaciones Interétnicas en Atacama' (2015) 51 Estudios Atacameños 49.
- Moran N and others, 'Lithium in Hot Water: The Resource, the Extraction and the Sustainability of Salt Flat Brines' (2021) 22 Geochemistry, Geophysics, Geosystems e2020GC009345.
- Munk LA and others, 'Lithium Brines: A Global Perspective' (2021) 50 Reviews in Economic Geology 339.
- Perrone NM and Cotula L, 'The Governance of Lithium in Chile' (2022) 25 Journal of International Economic Law 148–170.
- Revelle R and Suess HE, 'Carbon Dioxide Exchange Between Atmosphere and Ocean and the Question of an Increase of Atmospheric CO₂ During the Past Decades' (1957) 9 Tellus 18.
- Sachs JD and Warner AM, 'Natural Resource Abundance and Economic Growth' (NBER Working Paper No 5398, 1995).
- San Martin W and Wood N, 'Pluralising Planetary Justice beyond the North-South Divide: Recentring Procedural, Epistemic, and Recognition-Based Justice in Earth System Governance' (2022) 128 Environmental Science & Policy 256–263.
- Stevens P, 'National Oil Companies and International Oil Companies in the Middle East: Under the Shadow of Government and the Resource Nationalism Cycle' (2008) 1(1) The Journal of World Energy Law & Business 5–30.
- Sovacool BK, 'The Precarious Political Economy of Cobalt: Balancing Prosperity, Poverty, and Brutality in Artisanal and Industrial Mining in the Democratic Republic of the Congo' (2019) 6(3) The Extractive Industries and Society 915–939.
- Sovacool BK and others, 'Sustainable Minerals and Metals for a Low-Carbon Future' (2020) 367 Science 30–33. DOI: <https://doi.org/10.1126/science.aaz6003>
- Sovacool BK, Hook A, Martiskainen M and Brock A, 'The Decarbonisation Divide: Contextualising Landscapes of Low-Carbon Exploitation and Toxicity in Africa' (2020) 60 Global Environmental Change 102028.

Temper L, Del Bene D and Martinez-Alier J, 'Mapping the Frontiers and Front Lines of Global Environmental Justice: The EJAtlas' (2015) 22(2) Journal of Political Ecology 255–278.

van Pampus M, Hogenboom B, Hoorn C and Seijmonsbergen AC, 'Uncertainties in the Debate on the Environmental Impact of Lithium Brine Extraction in the Salar de Atacama, Chile' (2023) 1 Evolving Earth 100024.

Vera ML, Torres WR, Galli CI and others, 'Environmental Impact of Direct Lithium Extraction from Brines' (2023) 4 Nature Reviews Earth & Environment 149.

Voskoboynik DM and Andreucci D, 'Greening Extractivism: Environmental Discourses and Resource Governance in the "Lithium Triangle"' (2022) 5(2) Environment and Planning E: Nature and Space 787.

Reports

Albemarle Corporation, Annual Report 2024 (2025) available at: Albemarle Annual Reports (accessed 23 July 2026).

Albemarle Corporation, 2023 Sustainability Report (2024).

Albemarle Corporation, 2024 Sustainability Report (2025).

Boyd DR, The Right to a Healthy Environment: A User's Guide (UN Special Rapporteur on Human Rights and the Environment 2023).

Codelco, Codelco and SQM Sign Partnership Agreement to Develop Lithium in the Salar de Atacama (31 May 2024).

Comisión Nacional del Litio, Informe Final: Comisión Nacional del Litio (Ministerio de Minería 2015).

Corporación de Fomento de la Producción (CORFO), CORFO and Albemarle Reach Agreement for Sustainable Lithium Production in the Salar de Atacama (15 May 2024)

Fédération Internationale pour les Droits Humains (FIDH), Chile and the Indigenous Peoples: The Human Rights Impact of Lithium Mining in the Salar de Atacama (FIDH 2024).

Gobierno de Chile, Estrategia Nacional del Litio (Gobierno de Chile 2023).

Intergovernmental Panel on Climate Change, Climate Change: The IPCC Scientific Assessment (Cambridge University Press 1990).

International Energy Agency, Critical Minerals Market Review 2023 (IEA 2023).

International Energy Agency, Global Supply Chains of EV Batteries (IEA 2022).

<https://www.iea.org/reports/global-supply-chains-of-ev-batteries>

International Energy Agency, 'National Lithium Strategy' (IEA Policies Database, 2023)

<https://www.iea.org/policies/17958-national-lithium-strategy> accessed 23 July 2026.

International Energy Agency, Net Zero by 2050: A Roadmap for the Global Energy Sector (IEA 2021).

International Energy Agency, The Role of Critical Minerals in Clean Energy Transitions (IEA 2021).

<https://www.iea.org/reports/the-role-of-critical-minerals-in-clean-energy-transitions>

International Federation for Human Rights (FIDH), Lithium and Human Rights in the High Andean Salt Flats of Argentina, Bolivia and Chile (FIDH 2025).

https://www.fidh.org/IMG/pdf/lithium_and_human_rights_in_the_high_andean_salt_flats_of_argentina_bolivia_and_chile.pdf accessed 21 July 2026.

Organisation for Economic Co-operation and Development (OECD), OECD Environmental Performance Reviews: Chile 2024 (OECD Publishing 2024).

Organisation for Economic Co-operation and Development (OECD), Towards Green Growth (OECD Publishing 2011).

<https://doi.org/10.1787/9789264111318-en>

Silva Valenzuela N and Jara Villalobos CA, 'La Consulta Indígena de Proyectos de Inversión en el Sistema de Evaluación de Impacto Ambiental: Antecedentes y Resultados a una Década del D.S. 66/2013' (2023) 20 Revista de Derecho Ambiental 215.

Sociedad Química y Minera de Chile SA, Annual Report 2014 (2015) available at:

https://www.sec.gov/Archives/edgar/data/909037/000114420415031830/v410868_20f.htm accessed 23 July 2026.

Sociedad Química y Minera de Chile SA (SQM), Annual Report 2020 (2021) available at: SQM Annual Reports (accessed 23 July 2026).

Sociedad Química y Minera de Chile SA (SQM), Sustainability Report 2023 (2024).

Sociedad Química y Minera de Chile SA (SQM), Integrated Report 2024 (2025).

United Nations Conference on Trade and Development, Commodities at a Glance: Special Issue on Strategic Battery Raw Materials (UNCTAD 2020).

<https://unctad.org/publication/commodities-at-a-glance-special-issue-strategic-battery-raw-materials>

World Commission on Environment and Development, Our Common Future (Oxford University Press 1987).

World Meteorological Organization, Proceedings of the First World Climate Conference (WMO 1979).

World Meteorological Organization, Report of the International Conference on the Assessment of the Role of Carbon Dioxide and of Other Greenhouse Gases in Climate Variations and Associated Impacts (Villach, Austria, 9–15 October 1985) (WMO 1986).

News

BBC News, What is the impact of lithium mining? (YouTube, 25/05 2025)
<<https://www.youtube.com/watch?v=hthe8OqRmcs>> accessed 23 July 2026.

CNBC, Why Chile's Lithium Mining Is At A Crossroad. (Youtube 05/05/2023)
<https://www.youtube.com/watch?v=HSh6EgMwMOY>> accessed 23 July 2026.

Mining.com, 'Communities Agree to End Roadblocks at Chile Lithium Operations' (15 January 2024).

Reuters, 'Chile lithium miner SQM dealt blow by environmental court ruling', Al Jazeera (27 December 2019).

Reuters, 'Chile wants 3 or 4 new lithium projects running in 2026, finance minister says' (2 March 2024).

Artificial Intelligence Use Statement

Generative Artificial Intelligence was used during the preparation of this dissertation as a research support and writing assistance tool. Its use was limited to assisting with the organisation of ideas, refining the structure of chapters, identifying potential gaps in the literature review, improving clarity and coherence of drafting, and providing feedback on the logical progression of arguments.

All substantive analysis, interpretation of sources, selection of evidence, legal analysis, arguments and conclusions are the author's own. Every factual claim, citation and interpretation has been independently verified against the original source material, and all final editorial decisions remain the responsibility of the author.