The Divided Scales of Energy Transition: Discourses and devices of energy market-making in Chile

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Abstract

Chile's energy transition pathway has involved complex processes at multiple scalar entry points, with global investors, the central state, and the subnational state all playing distinct and intertwined roles. Offering a window into a country's journey through a divided energy transition, this thesis aims to demonstrate how relationships across scales are critical to understanding energy market-making. Aiming to both support and advance scholarly approaches that shine a light on overlooked dimensions of climate governance, the thesis' contribution is simultaneously methodological and conceptual. The thesis explores these dynamics at the regional, national, and local scales, as well as alignments and divisions between them, through interviews and participant observation conducted in Chile, as well as document analysis and collection of tender data. Discourses and devices used across these scales uncover distinct and often contrasting visions of energy transition. At the regional scale of Latin America, an analysis of renewable energy indexes reveals a dual discourse of spectacle and safety meant to allure investors. At the national scale of Chile, the central state's tender to procure generation plants reduces energy systems to a standardized framing that is friendly to multinational companies and binds investors and the central state together over time. And at the subnational scale in Renca, the concept of *dispositif* is employed to identify the extent to which an entrepreneurial local government has the capacity to implement its distinct vision of energy transition. While Renca attempts to center energy poverty alongside investability, the disciplinary nature of the pathway that global financial actors and the central state are advancing stifles this potential disruption. These findings demonstrate the constraints of incorporating locally derived visions into broader energy pathways, and the value of adopting a multi-scalar approach to understand these dynamics.

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(and one day maybe you'll understand why mama was always writing)

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Contents

Figures and Tables

Acronyms

APEC	Asia-Pacific Economic Cooperation
BRICS	Brazil, Russia, India, China, South Africa
CCTP	Technical Parliamentary Citizen Commission
CCU	United Breweries Company
CEPAL	Economic Commission for Latin America and the Caribbean
CHP	Combined Heat and Power
CNE	National Energy Commission
COP	Conference of Parties
CORFO	Chilean Economic Development Agency
DANIDA	Danish International Development Agency
EEL	Local Energy Strategy
EGEA	Entrepreneurship and Generation of Alternative Energy
FCM	Municipal Common Fund
GEF	Global Environment Facility
GWh	Gigawatt hour
IADB	Inter-American Development Bank
IEA	International Energy Agency
IPCC	Intergovernmental Panel on Climate Change
IRENA	International Renewable Energy Association
LGSE	General Electric Services Law
MW	Megawatt
MWh	Megawatt hour
OECD	Organisation of Economic Co-operation and Development
OLADE	Latin American Energy Organization
PPA	Power Purchase Agreement
RECAI	Renewable Energy Country Attractiveness Index
RedPE	Energy Poverty Network
REN21	Renewable Energy Policy Network for the 21st Century
SEREMI	Regional Ministerial Secretariats
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change

1. A divided energy transition

The headquarters of Chile's largest energy utility, Italian transnational company Enel, went up in flames on October 18, 2019, set on fire by protestors as a forceful and symbolic reproach of the state's dominant approach to governing the country's energy systems. Attacks on major infrastructure during the national Chilean uprising, or *estadillo social*, were broadly focused on the state's market-centric doctrine, targeting the high costs of public transport, health care, and electricity, plus privatization, government corruption, and inadequate pensions (Laing et al., 2019; Paúl, 2019). While not solely about energy, as electricity costs were only one of multiple demands, the protests brought new attention to the role of the state in bringing about multiple forms of economic inequality. Many Chilean online commenters cheered news of the burning building, explaining that it was 'only the fault of the government…that supports companies and not people' and that 'the government didn't want to listen' (BioBioChile, 2019). Pushed to respond to these demands, then President Piñera announced that measures to address electricity costs were among four actions of his administration's preliminary response (BBC News Mundo, 2019). Opposition to the state through an attack on the building of an energy company points to the close entwinement of the Chilean state with transnational companies in the design of its energy system, and demonstrates the public's perception of this problematic marriage.

Five years prior to this moment, similar protests against large energy infrastructure motivated the state to increase its control of the country's energy systems. When the Bachelet administration returned for a second term in 2014, the Ministry of Energy received instructions to draw up a new long-term energy policy that strengthened the Ministry's role. At the time, Chile was experiencing some of the highest electricity prices in Latin America, and the mining sector, a central player in Chile's economy, was facing the second highest price for electricity among mining countries worldwide (CNE, 2017a). The state also sought to diversify its energy matrix, attract renewable energy investment, reduce greenhouse gas emissions, and address longstanding challenges with energy security.

The resulting strategy of the Ministry, which shifted significant control from utilities to the state, was aimed at addressing high prices, market concentration and lack of competition, and major public challenges to new generation projects. Released in early 2016, *Energía 2050* set a target to generate at least 70 percent of the country's electricity from renewables by 2050. The primary delivery mechanism for this technological transition was a redesigned tender system that would be led by the Ministry instead of utilities, enshrined in an accompanying Tender Law. In parallel to these centralized energy transition goals, the new energy agenda also highlighted the importance of empowering regions and subnational actors. This aligned with a remarkable country-wide consultation process that the Ministry organized to develop the agenda, signaling the importance of responding to public criticism at that political moment.

As Chile's example will show, national and subnational energy transitions are carried out in parallel, disconnected, and often conflicting ways. In its implementation, national transition objectives have dominated the Chilean agenda and the state's actions reveal the continued centrality of a market-centric approach. Simultaneously, municipalities receive some support from the centralized state to articulate and attempt to finance their own local energy transition goals, but are also stymied by financial and other structural inequities that restrict the subnational state from realizing its ambitions. This amounts to a fractured energy transition in which the national state and the subnational state are often intertwined, each playing different and important roles, and yet often in opposition in their distinct approaches to energy transition.

This divided energy transition across scales frames this thesis, which investigates the state's role in Chile's renewable energy transition during the 2015-2020 period. The overarching argument is that adopting a multi-scalar approach facilitates a more authentic understanding of energy transitions in the Global South. Investigating the complexity of processes at different scalar entry points reveals distinctive dimensions of how they work. Scholars have already investigated some of these dimensions, using varying conceptual toolkits to interpret them. The thesis advances these lines of inquiry. At the same time, in examining how these multiple dimensions intersect and come into relation in its study site, Chile, the thesis aims to provide an example of how the various complexities, contingent relations, and openings come into view as these processes play out on the ground in particular sites. In demonstrating the value of a multi-scalar approach, the thesis' contribution is simultaneously methodological and conceptual, aiming to both support and extend scholarly approaches that shine a light on overlooked dimensions of climate governance.

The thesis also builds on debates involving the value of scalar approaches. Discussions of scale in human geography range from attention to the importance of multiple scales to outright rejection of this conceptualization. Taylor (1982) pointed to a politics of scale encompassed by the structure of the urban, nation state, and global. On the other end, Marston et al (2005: 416) proposed eliminating the idea of scale, given that 'hierarchical scale comes with a number of foundational weaknesses that cannot be overcome simply by adding on to or integrating with network theorizing.' They argued that the hierarchical nature of scale attaches a 'spatial register in the scaffold imaginary' that validates neoliberal thinking and is 'limited by top-down structural constraints.' Their alternative is a flat ontology or horizontality that 'provides more entry points - conceived as both open multi-directionality and unfolding non-linearly - for progressive politics, offering the possibility of enhanced connections across social sites…' (Marston et al., 2005: 427).

Responding to Marston et al, Jonas (2006) argues that one cannot deny the scalar dimensions of causal processes. He points out that scalists are preoccupied with 'the territorial hierarchies through and around which political and economic spaces of capitalism and the state are reworked' because scale is precisely the lens through which capitalism and the state are operating (Jonas, 2006: 400). Essentially, rejecting scale is refusing to acknowledge the reality of the very forces that are organizing at those scales. Rejection of scale also means extracting oneself from contemporary dialogues, as 'the politics of scale is partly about getting scholars of

different disciplinary persuasions to embrace wholeheartedly concepts and practices of scale-spatiality' (Jonas, 2006: 399). Bridge et al. (2018: 14) affirm that a 'multiplicity of scales' is a methodological approach that provides 'several different perspectives onto a common process, such as energy transition or securitization. In this way, alternative scales can be harnessed to explore the specificities and limitations of analysis conducted at a single scale.' And in particular, the topic of energy transitions in the Global South involving the influence of global investors 'illustrates the analytical value of holding together both global and domestic scale processes' (Bridge, 2018: 15).

The approach of this thesis has thus been trained at this middle ground where scalar and relational approaches can coincide (MacKinnon, 2011), a way of understanding complex processes of change rather than any simple meshing of vertical and horizontal (Jonas, 2006). Swyngedouw (2004: 26) conceives of scalar configurations either as regulatory 'geographical-institutional arrangements' or networked 'spatial or geographical arrangements of interlinked economic activities.' Looking across multiple scales facilitates attention to dependencies, in order to start to disentangle them (Gustavsson et al., 2009). Scales are the critical site of empowerment, disempowerment, and resistance (Jonas, 2006), and they shift and influence one another over time and are in a state of constant transformation (McMaster and Sheppard, 2008). The depth of scales changing has been found to be 'perpetually redefined, contested and restructured in terms of their extent, content, relative importance and interrelations' (Swyngedouw, 2004: 33). Betsill & Bulkeley (2007) establish that accounting for these shifts and influences between scales is essential to understanding the multilevel nature of climate governance as well as different types of authority and actors beyond a traditional understanding of the state (Betsill and Bulkeley, 2006).

In advancing this scalar and relational approach, the thesis advances its overarching claim via three key scalar entry points & supporting arguments. Latin America has recently become regarded as highly investable, opening up the space for new energy transitions at regional, national and subnational scales. The thesis examines these dynamics first by seeking to understand what contributed to Latin America's regional energy boom and how investors determine and create discourses to signal investability. Investigating market-making strategies reveals Latin America's framing as a promising new regional frontier, in which a dual discourse of spectacle and safety was constructed to create financial directions that remove barriers to the circulation of capital. Second, the thesis turns to the role of the state in Chile's energy transition. The first country to privatize its electricity sector in the 1980s, Chile relies on a streamlined tender process to deliver the cheapest and fastest route to transition to renewable energy infrastructure, shaped by complex legacies of neoliberalism. Using the tender to procure utility-scale electricity generation, the central state effectively reduces energy systems to a standardized framing that aligns with the interests of global financial actors, binding them to the central state over time. And third, it examines how alternative visions emerge at the subnational scale through the case of Renca, a municipality that has sought to be among the first to build innovative decentralized infrastructure while addressing energy inequities in its local energy system. Seeking to uncover how the subnational scale interacts with other scales, the thesis examines evidence of power differentials that stymie the realization of Renca's vision. This is

explored through the Foucauldian concept of *dispositif*, often understood as a governance apparatus that is formed from the coherence of diverse elements in complex and fluid ways (McGuirk and Dowling, 2020). By detailing the processes of energy market-making at each of these scales, the thesis demonstrates the utility of a multi-scalar lens to fully appreciate the reality of energy transitions in the Global South.

In order to situate this study, this introductory chapter turns next to Chile's trajectory of neoliberalism and centralization, which has shaped the role of the central state in governing the country's energy systems (Section 1.1). The chapter then explores in Section 1.2 how transitions in energy systems have come to be understood through a review of four broader conceptual approaches in geography. Section 1.2.1 examines scholarship in the arena of political economy which helps illuminate the power of global economic actors in seeking new accumulation frontiers for renewable energy investment and how those influence fiscal geographies in Chile. This area of scholarship highlights the importance of bringing aspects of power, structure and agency to the forefront, as well as the dispersed and multi-scalar nature of the state. Adding to this framing, the rapid growth of financial sector interest in renewable energy, most recently in the Global South and particularly Latin America, necessitated examining literature focused on the power of financial actors and the directions they create through processes of financialization in Section 1.2.2. This literature aided in incorporating linkages across scales into the frame. However, the more nuanced tactics of financial actors to create investment directions are not always plainly visible through this literature. Thus this project also explored cultural economy literature to understand the discourses and devices, and the use of calculation and commensuration to construct energy markets in Section 1.2.3. Finally, given the critical role of urban environments in understanding the role of the state and financial directions, literature on urban political ecology helped to unpack the power dynamics and tensions facing subnational governments, while urban climate finance provided an important window into the ways that cities are reformatted to capture global investment (Section 1.2.4). The final section of this chapter (Section 1.3) brings these approaches together to form the conceptual framework that grounds the thesis and sets out its objective, research questions and structure.

1.1. Latin America's neoliberal darling

Any understanding of energy transitions in Latin America has to take into account its histories of neoliberalism, centralization and the changing nature of the state. This section turns first to the regional context of resource extraction and neoliberal energy systems which has shaped the dynamics of 'investability' in renewables before focusing in on the historical specifics of the Chilean case.

1.1.1. Resource extraction and neoliberal energy systems in Latin America

The present day approach to renewable energy development in Chile, and in Latin America, was built on a centuries old history of extraction. Resource extraction for global profit has long

been the norm in Latin America, looking across the region's history starting with the conquest of Indigenous peoples for the purpose of capturing and exporting resources outside of the Americas (Bury and Bebbington, 2013; Perreault, 2018). As Perreault (2018: 239) notes, 'little of the wealth extracted from the mines at Potosí, Oruro, Huancavelica, Cerro de Pasco and elsewhere remained in those regions.' Parallelling the discourses used more recently to persuade investors to invest in the region's renewable energy resources, 'Columbus' description of the lands of the Western Hemisphere bears a striking resemblance to what today would be referred to as a venture capital business proposal' (Bury and Bebbington, 2013: 29).

Pillaging of Latin America and its peoples and resources took various forms in the centuries that followed. Galeano (1997) famously catalogued the history of natural resource extraction that opened the veins of Latin America to Europe and Gudynas (2021) demonstrated that development strategies in the Global South cannot be understood without examining the role of extractivism. Central features of resource extraction in Latin America were the demographic collapse of Indigenous peoples, Spanish and Portuguese colonialist exploitation (Bury and Bebbington, 2013), and 'the ravenous appetite of the Northern countries for silver and gold in the seventeenth and nineteenth centuries and then tin and copper in the twentieth' (Farthing and Fabricant, 2018: 5). The early twentieth century saw ups and downs in resource extraction in the region due to the Great Depression and World Wars, followed by decades of growth in hydrocarbon and mineral production (Bury and Bebbington, 2013). And governments in the region continue to see 'resource extraction as a development strategy' (Perreault, 2018: 239). Even leftist governments have repressed Indigenous and social movements that protest resource extraction (Anthias, 2018).

A modern form of resource extraction is the liberalization of the region's energy systems, which started to spread across Latin America in the 1970s, leading to the 'lost decade' of the 1980s. In response to debt crises in Latin American countries, structural adjustment packages of international finance institutions introduced loans that came with a set of marketization and privatization requirements (Liverman and Vilas, 2006). Privatization of many government-controlled firms began in Chile in the 1970s, in Mexico in the 1980s, and in Argentina, Bolivia, and Peru in the 1990s (Liverman and Vilas, 2006). Alongside fiscal austerity measures and reduced social services, the World Bank and regional banks pushed for marketization of the energy sector, resulting in Latin America leading privatization of this sector globally (Williams and Ghanadan, 2006). Energy-related operations and natural resource concessions were sold to investors, and new state regulations emerged to facilitate this process (Bury and Bebbington, 2013). Investment in hydrocarbons exploration in Latin America amounted to around USD $2 trillion between 1996 and 2007, and the majority of investment during these decades went to larger economies in South America (Bury and Bebbington, 2013). The 1990s saw new economic growth in the region, and a new period of prosperity in many of the region's urban areas, as an 'extractive boom' brought about a significant expansion in mining and fossil fuels development (Perreault, 2018: 240). However, these neoliberal reforms 'altered neither the structural conditions of dependence nor the class relations which led to or exacerbated the economic crisis.' Local economies were made more susceptible to the interests of global finance, ushering in deeper inequality and poverty. Chile, for example, experienced

deindustrialization and lower levels of investment as a result of these packages and real wages dropped by 10 percent during 1970-1990 (Glassman and Carmody, 2001: 83).

1.1.2. Chile's neoliberal legacy and the uprising against it

Aligned with and driven by structural adjustment programs throughout Latin America, Chile's neoliberal legacy is an important framing for this research project. As part of the leadership of the Pinochet dictatorship, economists known as the Chicago Boys committed to making Chile the region's most neoliberal devotee. As the 'first great experiment with neoliberal state formation,' Chile privatized education, healthcare, and pensions, reducing the state's responsibility for these services as well as expanding foreign direct investment and facilitating private exploitation of natural resources (Harvey, 2007: 26). Through deregulation of trade and finance, a key shift in these reforms was the prioritization of global capital over locally grounded economic productivity (Taylor, 2006), which set the stage for the increasing prevalence of financialization.

The constitution of 1980 brought about by Pinochet embedded these tenets, and was designed to prevent any future dismantling of the dictatorship's neoliberalist mechanisms (Couso, 2021). Chile's constitution gives supremacy to the market over democratic legislative actions that represent the will of the people (Pizarro Hofer, 2020). A central feature of the constitution's neoliberal leanings is the interpretation by Chilean scholars that it embeds the 'principle of subsidiarity,' positioning the state as subordinate to the market and only stepping in when private entities cannot fulfill that role (Couso, 2021: 239). Health care or social security are to be provided to Chilean people, but they must always have both a private and public option to choose from, which in practice has prioritized private options (Couso, 2021; Hiner et al., 2021). Equally critical to the dictatorship's neoliberal vision was Pinochet's desire to do away with dissent. Thus these provisions were accompanied by the constitutional rule that some members of Congress would not be elected, successfully facilitating right-wing control (Hiner et al., 2021). When Pinochet was ousted and the country transitioned from a dictatorship to a democracy in 1990, many of the tenets still remained intact (Casals, 2022).

Due to the constraints of these constitutional mechanisms, the legacy of Pinochet framed decades of Chilean history well beyond the dictatorship. The dictatorship created deep economic insecurity (Couso, 2021) while ruling through violence and crushing any opposition, leading to the murder, torture, and disappearance of thousands (Hiner et al., 2021). Then in the 1990s, 'neoliberalism gained the democratic legitimacy that it had previously lacked' as poverty decreased for many Chileans and wealth accumulation expanded for some, such that 'for some years, the free market, social stability, and sharp inequality seemed perfectly compatible' (Casals, 2022: 88). And yet under the Chilean model, 'health, education, and social security are commodities traded on the market' leading to high income populations paying for quality health services, education, and pensions, while everyone else suffered through low quality state-sponsored versions of these services alongside low wages (Pizarro Hofer, 2020: 336). These inequalities grew more entrenched, and in recent decades the idea of a new constitution

started to emerge among social movements seeking to upend Pinochet's neoliberal paradigm (Couso, 2021). The two Piñera administrations emerged as a target of these movements, as the ideology of Pinochet was resurrected, 'exposing the mechanisms of accumulation and marketization that were previously hidden behind a veneer of progressivism' (Casals, 2022: 89).

The Chilean uprising in 2019 introduced at the outset of this chapter was a climax of the dissent against the devastation caused by this neoliberal paradigm. Protest movements had been building around private retirement accounts, Indigenous land conflicts, and feminist campaigns. The second Bachelet administration attempted to initiate constitutional change, but lacked the political support (Casals, 2022), particularly in light of the constitutional constraints noted above. The 2019 uprising represented a watershed moment departing from the status quo (Suarez-Cao, 2021) in which 'the old Chile unexpectedly broke apart' (Casals, 2022: 87), although perhaps only the country's elites were surprised.

The uprising also forms an important context for this research project because it represents broad public criticism of the centralized state's role governing the country, with electricity prices among the complaints. Initiated by high school students protesting a metro fare increase in the capital of Santiago, the most significant uprising since the end of the dictatorship paralyzed the capital and major cities throughout the country to 'denounce the underlying violence of neoliberal normalcy' (Cobos, 2021: 539). Frequent among the chants of protestors were slogans such as, 'neoliberalism is born and dies in Chile' (Hiner et al., 2021: 278) and 'it is not 30 cents, it is 30 years,' meaning the protests were about the 30 years of inequality during the post-dictatorship period rather than just the metro fare increase (Suarez-Cao, 2021: 255). Comparisons of Piñera to Pinochet were prominent and 'highlighted the build-up of discontent generated by the structures of a deeply unequal society' (Dragnic, 2020: 311).

The Piñera administration's response was repression and martial law, declaring war against the protestors and ordering tanks and military into the streets, 'recalling the darkest moments of the military dictatorship' (Casals, 2022: 92). Borders were closed, a curfew established, and the 'carabineros' armed forces used tear gas, rubber bullets targeting eye mutilations, torture, sexual assault, and other forms of police brutality as means to deter the protestors (Casals, 2022; Hiner et al., 2021). Millions occupied the capital on a weekly basis and 'a rage burst from our poorest neighbourhoods' that set many metro stations on fire, looted supermarkets, constructed barricades and threw rocks at the carabineros and tanks, and destroyed city infrastructure and covered it with graffiti (Garcés, 2019: 483). Eventually Piñera acquiesced to the demands of multiple opposition parties demanding a plebiscite on constitutional reform (Alemán and Navia, 2023), a process representing 'the institutionalization of the conflict started by the uprising' and a significant challenge to the neoliberal legacy of the dictatorship (Casals, 2022: 93).

1.1.3. A stronghold of centralization

Alongside economic liberalization, the centralization of energy governance in Chile is a reflection of the country's long history, from colonial times, of authority being highly concentrated at national scale. Chile's governance structure is the most centralized across South America (Vial Cossani, 2013). The country's subnational governance structure includes 15 regions led by centrally-appointed intendants and 56 provinces led by governors. At the lowest administrative level, there are 345 *comunas* led by mayors and councils (Livert et al., 2024; OECD, 2017). Compared to other OECD countries, subnational authorities in Chile have the lowest income and spending. They cannot borrow capital, and transfers received from the central government are earmarked for specific sectors. Chilean local government involves the implementation of uniform norms established by the central government, without taking local needs into account, reducing local government to a public service administrator with limited authority (OECD, 2017). The centralized nature of governance is often referenced as the reason that Chile developed faster than other Latin American countries. But given that regions and municipalities remain dependent on the central government, deep inequalities have continued to grow more pronounced.

This legacy of centralization can be traced from the civil wars after independence from Spanish colonial rule through to the era of Pinochet. While the first formations of local government emerged after the capital of Santiago was founded in 1541, it was the Constitution of 1833 that established the country's municipal system (Letelier, 2006). Tensions between centralized and regionalized approaches emerged through civil wars of the 1850s (OECD, 2017) and 1891, the latter conflict leading to the establishment of the first instance of municipal autonomy (Walter, 2004). The Constitution of 1925 enshrined the principle of municipal leaders being elected, however it also gave provincial assemblies control over municipalities and mayors of large cities would still be appointed centrally. Regions were established in 1974, and the provisioning of education and health care was delegated to municipalities in 1980, although these functions were still understood as 'agent tasks of the central government' (Letelier, 2006).

In contrast to this incremental progress toward municipal autonomy, the Pinochet dictatorship of 1973-1990 emphasized a turn back toward centralization that has largely remained in place until present day. Pinochet was the first national leader to appoint regional authorities, who reported to him directly. Until 2021, Chile was the only country in South America where regional authorities were appointed by the President, rather than elected democratically (Livert et al., 2024; Vial Cossani, 2013). Municipal authorities were also appointed by Pinochet rather than elected. Although this was the first time that the central state was more active in regions outside of Santiago, the narrow purpose of this regional engagement was to protect borders and maintain control by the political elite (Montecinos, 2019; Navarrete-Yánez and Higueras-Seguel, 2014).

Recent decades have seen continued struggles between strengthening and loosening the grip of the centralized state, particularly between 2006 and the 2019 uprising, when the country's leadership alternated between Bachelet and Piñera administrations. Piñera's administrations

reinforced existing centralized structures that perpetuated dependence on the central state, for example suspending a re-evaluation of financial contributions to municipalities (Cravacuore, 2014). During the second Bachelet administration, the need to decentralize power was on the national agenda for the first time, with a movement to elect regional authorities democratically, however there was still little attention to boosting *comuna* authority. In 2017, new legislation was passed that regional governance would include both an elected Regional Governor and a Regional Presidential Delegate appointed by the President beginning in 2021 (Montecinos, 2019).

As a result of this history, Chilean *comunas* remain administrative bodies rather than carrying any authority, significantly constraining their power. Following independence from colonial rule, and again after the Pinochet dictatorship, *comuna* leaders in Chile were elected democratically. But Pinochet restricted the role of *comunas* to administering services, without legal autonomy or election by their populations (Galilea et al., 2011; Vial Cossani, 2016). *Comunas* are handed directives and finance to implement centrally-defined policies, described as a 'straitjacket' of administrative and fiscal dependence on the central government (Vial Cossani, 2016: 110; Villagrán, 2015). Implementation and financing is subject to the direction of ministries or Regional Ministerial Secretariats or SEREMIs (Cravacuore et al., 2024). Resource allocation is similarly designed to constrain subnational power. Regional governments in Chile have relied on transfers from the central state for 99.91 percent of their income (Vial Cossani, 2013) and *comunas* collect only 10 percent of the country's public revenues (Vial Cossani, 2016).

This long stronghold of centralized power explains the current challenges that *comunas* face in attempting to finance initiatives that differ from the interests of the national state. During the dictatorship period, the key mechanism established to distribute finances to *comunas* was the Municipal Common Fund (FCM), in which *comunas* contribute according to their tax income, and receive funds at the level of need. If a *comuna* receives higher income through taxes, it receives less resources from the FCM and this is the way that the fund grows, but mayors that increase or enforce taxes are less likely to win re-election. According to the National Municipal Information Service, about 88 percent of *comunas* depend on the FCM for close to their entire budget (Acuña Castillo, 2022). This has left *comunas* that face significant poverty without adequate financing, and mayors of these *comunas* unable to charge taxes at a level that fulfills the population's needs.

1.1.4. Evolution of state governance of Chilean energy systems

The emergence of Chile's modern energy system was closely tied to its mining industry, and initially governed jointly by the mining and economy ministries. The first regulatory framework for the country's energy systems emerged in 1925 through the General Electric Services Law (LGSE), giving the national state more control over pricing, natural resource concessions, and transmission. Updated versions of the LGSE emerged through the mid-1900s, expanding the role of the state in response to electric supply problems and ushering in pricing reforms (Instituto de Ingenieros de Chile, 1988). Then in the early 1970s, the socialist Allende

administration moved to nationalize large-scale industries such as copper and coal mining, citing excessive profits by foreign-owned mining companies and subsequently reducing compensation to those companies for negative impacts they had caused (Faundez, 1978).

The Pinochet coup in 1973 sought to reverse this process, moving the country's energy systems toward a market-based model and privatization. The military dictatorship returned companies to their former owners and brought about the world's first electricity reform based on market deregulation (Allain and Madariaga, 2020). The new constitution under the dictatorship emphasized a market-centric economy, a new regulation envisioned the country's natural resources as a 'marketable commodity,' and the National Energy Commission (CNE) was established (Poque González et al., 2023: 3). The LGSE was updated again to put the market at the center of generation, and monopoly companies in charge of transmission and distribution (Poque González et al., 2023). While the national state was 'highly constrained' and relegated to handling only regulatory matters, incumbent companies were empowered to define energy policy based on price signals (Allain and Madariaga, 2020: 678).

Despite the end of the dictatorship, the 1990s saw a continuation of the market-centric approach to energy governance. By the end of the decade, 93% of electric generation was in the hands of only three companies (Allain and Madariaga, 2020). In the late 1990s, an energy supply crisis was driven by hydroelectric generation being crippled by drought, reductions in natural gas imports during neighboring Argentina's political crisis (Amigo et al., 2018) that led to higher energy prices, as well as growing energy needs of the Chilean mining sector (Furnaro, 2019). Chile experienced blackouts, paving the way for new regulations on transmission and distribution, targets to achieve renewable energy generation, as well as an auction mechanism (Madariaga and Allain, 2018). In parallel, major social movements emerged around the social and environmental impacts of large hydropower projects in the central and south of the country.

The first Bachelet administration (2006-2010) strengthened the role of the national state with the establishment of the Ministry of Energy in 2009, separating oversight of energy policy from the Ministry of Mining. New quotas for renewable energy and distributed generation were established, as well as the new energy agenda *Energia 2050* (Poque González et al., 2023). Drawing on various citizen-led participatory efforts to envision a new approach to energy policy, such as the public-private initiative *Escenarios Energéticos 2030*, the two-year process to develop *Energia 2050* launched in 2014. Although it included a comprehensive participatory component that involved civil society, private sector, and technical experts (Bustos-Salvagno, 2019; Madariaga and Allain, 2018), the extent to which the process involved meaningful participation has been broadly disputed (Allain and Madariaga, 2020).

In more recent years, the participatory and decentralization threads of the Energia 2050 process were translated into an expansion of the state's role in energy systems at the municipal level. The central state's role has been most visible internationally through the redesign of the procurement of utility-scale infrastructure via the tender, the focus of Chapter 4, as historically 'state intervention meant supporting the investment plans of the big players in the sector' (Madariaga and Allain, 2018: 12). But in parallel the central state under the second Bachelet

administration (2014-2018) developed new subnational mechanisms. At a time when there were few *comunas* in the Metropolitan Region and throughout the country that employed any energy professionals, the Energy ministry established SEREMIs that focused on energy as well as the local energy planning program *Comuna Energética.* But in practice, the approach has been one of 'regionalization,' filtering centrally-derived agendas down to the subnational scale.

SEREMIs were established to implement the policies and programs of ministries in each of the regions and improve coordination between ministries and municipalities. The SEREMIs of the Energy Ministry have provided trainings for municipalities on electricity laws, for example tariff and distributed generation laws, served as a mediator between communities and corporations when there is a conflict over an infrastructure project, and accompanied municipalities as they developed local energy projects. However these regional mechanisms carry little authority and answer to the Energy ministry rather than the mayor (Llancar Etcheverry, 2009), allowing the central state to maintain control. The extension of the central state's role into local energy systems was transformed once more during the second Pinera administration. The Energy SEREMIs were kept in place, but their budgets were removed, development of regional energy plans was halted, programs were privatized, and financing programs were constrained. In response to a lack of state funding for small community generation projects in *comunas*, staff of Energy SEREMIs were forced to consider experimenting with crowdfunding or setting up an investment fund to attract individual donors. While expected to decentralize energy governance, the SEREMI mechanism has not carried enough authority to accomplish this (Escrig Durán, 2024), leaving state control of energy systems largely centralized within the Energy ministry.

The second mechanism expanding the state's role in local energy systems is the *Comuna Energética* program. Originally positioned under the Energy ministry, the program supports municipalities in developing a Local Energy Strategy and requires installing a municipal staff person as an energy counterpart. State resources for local energy planning decreased significantly under the Pinera administration, which emphasized private partnership to fund local energy initiatives and moved the *Comuna Energética* program under the Sustainable Energy Agency, a quasi-public entity that can receive funds from companies. The *Comuna Energética* program's funding became reliant on the volunteer investment of large companies to fund the development or implementation of Local Energy Strategies. Other state funding options for municipal energy projects existed, such as the National Fund for Regional Development and Neighborhood Improvement Plans, but they remained very limited and insufficient and energy projects often lost out to initiatives on other topics such as health or transportation.

These long histories of neoliberalism and centralization are important framing for understanding energy transition in Chile and in Latin America. The liberalization of energy systems is an extension of the long history of resource extraction in Latin America for global profit. Through the neoliberal regime of Pinochet dictatorship, the principle of subsidiarity made the state subordinate to the market, an ideology resurrected during the more recent Pinochet administration. Centralization also has a long history in Chile, leaving local governments with no legal or fiscal autonomy. Pinochet brought about the world's first privatized electricity sector and constrained the role of the national state, but in the last decade the national state's role was expanded and some limited steps were made toward decentralization. Building on these

existing dynamics, the following section explores relevant literature in four arenas to inform a conceptual framework.

1.2. Literature on energy transitions and the making of energy markets

Given the complex political economic transitions in Latin America, as explored through the historical geography of Chile presented above, the making of markets comes to be central to any understanding of energy transitions. This section thus turns to four different literatures that help to understand how energy markets are made and mobilized in transitions at different scales. These literatures examine the role of the state and of financial actors, and the discourses and devices they use to make energy markets.

To investigate the complex role of the state in making energy markets, Section 1.2.1 first looks at the arena of political economy to bring power, structure and agency into view, as well as the dispersed and multi-scalar nature of the state. Then to capture the broader context of investment being directed toward Chile, Section 1.2.2 turns to literature examining the power that financial actors wield in making markets and the ways that discourse and narrative are used to influence the directions of financial flows. This section also looks at concepts of financialization and assetization as prime consequences of market-making that have been observed as a significant trend in Chile and Latin America. With the aim of shedding light on the discourses and devices used by financial actors and the central state to build a renewable energy market in Chile, Section 1.2.3 then examines literature on the ways in which calculative devices create markets, using commensuration to frame what is legible and creating assemblages of people, objectives, and technologies. Finally in Section 1.2.4, the unique experience of market-making at the subnational scale warranted an examination of literature on urban environments, leading to a review of urban political ecology and the inequities and tensions in the production of urban environments, as well as urban climate finance and how cities of the Global South and emerging economies are increasingly viewed and constructed as new frontiers for global finance.

1.2.1. The state role in energy transition

To understand market-making in energy transition, the role of the state is of central importance. Literature in the political economy arena challenges transition theory's narrow focus on agency, allowing for structural elements to come into view in relation to the state's market-making activities. Equally relevant is the interplay between state and capital and the dispersed and multi-scalar nature of the state, all of which are examined below.

Energy transitions are often examined through the dominant theory of socio-technical transitions, which provides an important foundation for understanding the changes underway in energy systems but carries inherent limitations. The concept of socio-technical transitions is used to describe complex changes in transport, energy, or agriculture, encompassing many

different elements of ‘technology, policy, markets, consumer practices, infrastructure, cultural meaning and scientific knowledge’ (Geels, 2011: 24). Geels (2014: 22) explains the emergence of green innovations as coming about through a ‘multi-level perspective’ in which growing ‘niche-innovations’ (Geels, 2014: 23) align with landscape changes that put pressure on the existing regime.

While scholars within transition studies have sought to explain power and acknowledge political economies, they often end up centering an agency framing that interprets structure as being the effect of powerful individuals. Emphasis is placed on ‘regime actors’ and the influence and dependencies created through ‘relational networks between big business and senior policymakers’ (Geels, 2014: 26). Efforts to incorporate attention to power relations still limit the fundamental conceptual ambiguity as ‘*who* exercises power and *who* is empowered by and with *whom*’ (Avelino and Wittmayer, 2016: 628). Despite the conceptual value offered by transitions theory, it has been critiqued for not putting enough emphasis on the structural elements of power.

Political economy brings aspects of both structure and agency to the forefront, identifying the ‘capacity and autonomy that states have to secure and negotiate different outcomes’ (Power et al., 2016: 4) in light of the ‘structural power of capital in a globalised economy’ (Power et al., 2016: 12). A political economy perspective also aids in identifying the ‘discourses, institutions and interests that shape energy transitions and enhances our understanding of who sets the terms of energy transition and how, whose interests are served as a result and how relations of power within and beyond the state shape the adoption of one energy pathway over another’ (Power et al., 2016: 3). A focus on structure illuminates the multiple *forms* that transitions can take (Johnstone and Newell, 2018; Newell, 2018), and questions ‘the assumption that transitions can be made up of open ended choices’ for states (Newell, 2018: 9). The state and investors can exercise power to ‘block change until such time as the interests of capital in general are perceived to be served by an alternative energy base’ (Baker et al., 2014: 813). The central role of incumbent energy companies in setting the pace and direction of energy transition is particularly apparent within this expanded lens of structure and agency (Baker et al., 2014). In the creation of low carbon innovations, power is concentrated among a small group of state actors and financial actors who play a role in securing new modes of investment and new sites of accumulation (Newell, 2014). Global economic actors also brandish control of energy transition directions, through ‘disciplinary’ (Newell and Phillips, 2016: 40) power that includes structural and material financial power alongside a ‘discursive power to legitimise, validate and embed neoliberal models of transition’ (Newell and Phillips, 2016: 42). While technological transition to renewable energy may be occurring, it may not be accompanied by a transition in existing power relations (Newell and Phillips, 2016: 47).

There is a considerable amount of reciprocity in the relationship between state and capital in energy transitions, through ‘territorial and capitalistic logics of power’ that are ‘tightly interwoven’ (Harvey, 2003: 183). Just as energy systems defy political boundaries and are geographically spread out, where ‘interlinked elements occupy locations in space,’ state and capital are, in reality, interlinked across any imagined dividing lines between the national and the international

(Bridge et al., 2013: 334). This ‘symbiotic’ (Baker, 2015: 148; Loftus, 2006) alliance ‘belies any sharp distinction between an external set of international donors and finance institutions on the one hand, and a bounded set of national and sub-national institutions on the other’ (Newell and Phillips, 2016: 41). State and capital work in ‘tight networks’ (Newell, 2014) toward a ‘common material interest and discursive commitment’ to private sector investment (Newell and Phillips, 2016: 43). This commitment to commercial development seems to supersede any commitment to expanding energy access (Power et al., 2016), demonstrating the importance of paying attention to ‘who controls the production, technology and flows of finance that will underpin a transition’ (Newell and Phillips, 2016: 46).

But there is also a long history of contradictions and tensions between state and capital (Bridge and Frederiksen, 2012) that persists in the context of energy transition. The state may push for bankable renewable energy investments that maximize profit, while simultaneously seeking to legitimize these projects by incorporating economic development requirements (Baker, 2015) or using these investments as evidence of addressing limited energy supply (Newell and Phillips, 2016). There are cases where a state pushed back against an increased role for the private sector, and in other moments was observed setting renewable energy prices that allowed existing private actors to maintain their dominance (Newell and Phillips, 2016). Similarly there are contradictions between the de-politicizing rhetoric that state and capital use to portray land, and the reality of renewable energy transitions that ‘re-centre land as the key resource and ensure that it is re-valued and re-politicised’ (McEwan, 2017: 10).

In the context of energy transition, the state has tended to favor existing forms of capital, prioritizing the incumbent energy regime. While to some extent the state has supported disruptions to the existing regime, albeit through a market lens (Newell and Phillips, 2016), in its support of financial liberalisation the state has often ‘reinforced the existing patterns of comparative advantage’ (Baker, 2015: 148), leaving dominant business models unchallenged and excluding renewable energy companies and civil society actors from decision making (Baker et al., 2014). State support for the mining industry has come in the form of reducing their electricity costs while increasing electricity costs that disadvantage others. In some cases expansion of renewable energy is partially negated by a parallel expansion of coal-fired electricity (Baker et al., 2014; Power et al., 2016).

In congruence with the state’s support of existing forms of capital that back an existing energy regime, capital also endeavors to resist losing power. New renewable energy investments have brought about a disruption of power relations to a certain degree, especially when national energy schemes attempt to make room for new renewable energy actors (Power et al., 2016). But incumbent electricity regimes work to maintain their foothold against niche actors and are able to ‘apply the brakes on more radical notions about how to advance a low-carbon economy in favour of more incremental forms of change’ which maintain their power (Baker et al., 2014: 809). These tendencies have been described as ‘slow and reactive’ (Baker et al., 2014: 814) and ‘reluctant’ to cede control (Newell and Phillips, 2016: 43). Financial actors resist ceding control in a number of ways - ’on a material level through control of production’ (Baker et al., 2014: 809) and control of market access, through a push toward financialization, through

contesting alternatives, and through close institutional arrangements with the state (Baker et al., 2014; Power et al., 2016). Incumbent energy regimes also resist losing power by characterizing energy as a lever of economic growth (Baker et al., 2014; Newell and Paterson, 1998), by inventing more acceptable forms of accumulation (Paterson 2010), or by interpreting their role as 'capital in general' (Newell and Paterson, 1998: 683) as opposed to capital that is tied to environmental aims (Newell, 2008: 515). Accumulation strategies are not limited to fossil fuel companies, as companies with renewable electricity are employing similar strategies (Harrison, 2022).

Following a recent ebb and flow of state support mechanisms around renewable energy investment, states that seek to accelerate the transition to renewable energy are now beholden to market-based approaches. As Christophers (2022: 1539) explains, 'having nailed their colours to the mast of private-sector-based renewables development, governments arguably do not have a choice.' Since governments rely on private sector investment to expand renewable energy, their options are limited to offering state derisking mechanisms that increase private profit or reducing subsidies that will slow down energy transition. Mechanisms such as feed-in tariffs should be considered subsidies as they 'promise to provide subsidy as and when the market requires it' (Christophers, 2022: 1531). Power Purchase Agreements can be seen to have replaced subsidies as they also provide stabilization required by investors, as their 'crucial market-making role…is all about raising finance' (Christophers, 2022: 1534).

The literature on socio-technical transitions has also struggled with the notion of the dispersed state, instead fixated at either the urban or the national level and not accounting for the ways in which multiple forms of state authority may be present in the structuring of an energy regime. Locating power 'in the executive branch of the state rather than in a more dispersed and less territorially organised manner' is only one element of the full breadth of state involvement in transitions (Johnstone and Newell, 2018: 79).

Approaches that draw on neo-Gramscian and governmentality studies move beyond an understanding of the state as an 'autonomous social sphere' (Bulkeley and Schroeder, 2012: 747). Instead, the state can be interpreted as a 'multiscalar institutional ensemble' (McGuirk, 2004: 1019) composed of public or private institutions that 'enable the dominant social group to exercise power' (McGuirk, 2004: 1022) or as a set of 'dispersed practices and knowledges' (Bulkeley and Schroeder, 2012: 748) rather than a single entity (Ekers and Loftus, 2008). The state plays a leading role but its power is dispersed in 'a series of situated power plays that… are at once strategic and diagrammed and experimental and assembled' (Langley, 2018: 173). Similarly, the state can be understood as a structural and symbolic 'effect,' the result of the many mundane practices undertaken by individuals ranging from state employees to journalists (Painter, 2006: 755). This enables an understanding of both infrastructural sites where the state's role may be more visible and the more 'intimate' and 'day-to-day acts' of provisioning services to a household (Ekers and Loftus, 2008: 710). A neo-Gramscianism perspective also introduces the idea of cultural hegemony, in which state and capital wield power through the propagation of certain ideologies and values, and the state is an instrument of a transnational historical bloc of actors that produces the dominance of the ruling class. The state-capital

relationship thus includes a ‘hegemonic understanding’, where governing is characterized by the creation of new forms of authority (Bulkeley and Schroeder, 2012: 754) and involving a fragile politics (Bulkeley and Castán Broto, 2013). The way we understand energy transitions should thus delve ‘deeper into the nature of the state in different contexts, in more relational terms that opens up the processes which (re)produce the assemblages of the state’ (Johnstone and Newell, 2018: 75).

The state is also multi-scalar in nature. Scholars that see the state as a singular entity describe how state involvement in industrial transformation can ‘affect a country’s place in the international division of labor’ (Evans, 2012: 11). Yet the state is not in a position to shape the behaviour or withstand the pressure of multinational firms (Baker et al., 2014; Power et al., 2016), or multilateral lenders or banks (Krippner, 2011), especially in the context of economic restructuring of the 1990s that weakened the state’s leverage (Baker, 2015). A dispersed understanding of the state helps to reveal its capabilities and authority, and brings into view the ‘complex linkages between diverse transnational actors from development donors to national energy companies’ (Power et al., 2016: 32). It also reveals ‘how much can be controlled and directed from above and how far even sweeping economic transformations can be planned and brought into being by states’(Johnstone and Newell, 2018: 79). A multi-scalar understanding of the state also illuminates aspects of obduracy and fragmentation inherent in some energy infrastructure and markets (Dowling et al., 2018), the fact that transitions bring about rescaling of energy technologies and governance (Bridge et al., 2013), and the ways in which subnational entities are responsible for addressing problems at multiple scales (Bulkeley et al., 2014). In some cases, companies bypass national state plans, transferring governance to supranational actors (Bumpus and Liverman, 2008).

Political economy literature importantly brings aspects of both structure and agency into consideration. Rather than entities operating completely separately, the state and financial actors work in a close relationship and a considerable level of reciprocity, with the state often tending to favor incumbents. This literature also highlights the multi-scalar and dispersed nature of the state’s power. These existing structures and the roles played by key actors provide a critical explanation for how markets are made for energy transition, while the next section provides additional insight into how financial actors create directions across scales.

1.2.2. The power of and directions created by financial actors

While the political economy literature outlined above offers an expanded understanding of the state’s role in making markets and brings both structure and agency into the picture, the state’s interaction with financial actors and processes and the sector’s tremendous power necessitates focused examination. Particularly salient is the financial sector’s evolution toward deepening investment in the Global South, its reliance on discourses and devices to construct markets, and the growing prominence of financialization in these processes.

Recent scholarship on renewable energy investment in the Global South illuminates case after case of the significant disconnect between local realities and global investment interests. In her examination of utility-scale electricity generation in South Africa and Mexico, Baker (2021) juxtaposes the competing objectives of generating a revenue stream for global investors with local development objectives, and questions whether capital can be disciplined to deliver on the latter. Kirshner et al (2019) document the establishment of a solar PV regime in African countries, calling attention to the need to center the context of 'localities, territories, and relationships' (Kirshner et al., 2019: 115). Addressing the assumption that only technology transfer is responsible for energy systems transitions, they highlight the 'localised histories and multi-scale interdependencies of incumbent energy landscapes that shape or inhibit the rollout of regime-like, maturing technologies' (Kirshner et al., 2019: 123). Rural communities and resources have been enrolled into sites of energy production in China through the privatizing and reframing of small hydro-power as low-carbon, in that 'its value is based on the amount of electricity it generates, not its contribution to poverty alleviation and conservation' (Harlan, 2018: 59). Helmcke (2023: 978) describes how infrastructure acted as a 'technology of detachment' in a large dam project in Colombia that 'destroyed the social and physical infrastructure in place, fragmented territory and marginalised affected populations further' (Helmcke, 2023: 976). Kennedy (2018: 236) finds a similar contradiction between the aims of expanding electricity access in Indonesia with the resulting development of large-scale centralized generation plants that end up undermining local control. The result is 'not only a flow of economic benefits out of the country and limited improvement in energy access for much of the country, but a missed opportunity in terms of maximizing the socially and politically transformative potential a broader energy transition may entail.' Expanded renewable energy investment is being driven by the 'reproduction of specific regimes of accumulation,' which in Chile for example benefits the copper mining industry (Furnaro, 2019: 19).

Some cases hone in on how these renewable energy investments reflect a continuation of the historical legacy of colonization. McDonald (2019: 2) points to a 'recolonisation along the power grid' in the restructuring and expansion of South Africa's electricity sector, following a 'business as usual' approach. The march toward 'new neo-liberal ideological, discursive and institutional frameworks serves to disguise the real beneficiaries of electricity reforms while at the same time opening up new terrains and spaces of accumulation' (McDonald, 2019: 3). Haag (2023) similarly points to colonial power and racial capitalism to explain the process of financial subordination that accompanied the emergence of renewable energy infrastructure in Senegal. Responding to postcolonial critiques of development in poorer countries of the Global South, (Castán Broto et al., 2018) Broto et al (2018) use the case of Mozambique to highlight energy sovereignty as a concept that incorporates elements of both energy justice and postcolonial approaches. Energy sovereignty 'complements energy justice thinking by emphasizing the need to recognize the autonomy and self-determination of people in framing energy decisions that affect them' (Castán Broto et al., 2018: 648).

The above examples indicate a heightened financial sector interest in renewable energy production in the Global South, signalling the importance of scholarship on the power of and directions created by financial actors. Finance has an ever expanding role in nature-society

relations (Bracking, 2019), as part of a ‘staggering growth of the financial sector in the neoliberal era’ (Ouma et al., 2018: 501). Castree and Christophers (2015: 397) equate financiers as having the power of an unelected government, one that is dictating the route of capital flows and ‘graphing the face of the Earth as they translate liquidity into enduring fixed assets essential to our shared future.’ While Mazzucato & Semienuk (2018: 19) point out that financial flows for renewable energy are heterogeneous in nature, and paying attention to the ‘historical directions these actors have created’ sheds light on what kinds of direction different forms of finance may create in future.

The directions created by financial actors to create green infrastructure can be understood as ‘a mechanism for securing the reproduction of capitalism’ (Ekers and Prudham, 2017: 15). In this view, the acceleration of Latin America’s energy transition responds to crises of underconsumption or overproduction elsewhere and the need to enlist new locations in capital markets (McCarthy, 2015). The narratives put forward by investors to sell Latin America’s investability, then, are in service of securing a ‘spatial fix’ (Harvey, 1982) where investment is diverted from one location to another and sunk into new infrastructure, facilitating a new but temporary home (Castree and Christophers, 2015; McCarthy, 2015; Ouma et al., 2018). This makes ‘investment of trillions of dollars in new sectors structurally imperative for capital’ (McCarthy, 2015: 2499), particularly in the context of the imminent overhaul of the world’s energy systems. The context of energy transition ushers in a new capital-nature relationship, ‘bringing new elements of previously free or unenclosed nature—wind, waves, sunlight, the heat of the earth itself—into circuits of capital and turning their energy into commodities’ (McCarthy, 2015: 2496). In Latin American countries, and other developing regions, access to sun and wind through cheaper land, combined with cheaper labor and technology, lowers the cost of building new infrastructure and facilitates a fix for infrastructure finance crises elsewhere. As capital moves ‘from the command centers of global finance into far distant places’ (Ouma et al., 2018: 501), the socioecological impacts will likely fall disproportionately on marginalized populations and on the global South (McCarthy, 2015).

If a fix is the removal of a blockage to the circulation of capital (McCarthy, 2015), the discourses that carry the message of investability are crucial for clearing those blockages away. Financial actors use these discourses to mobilize investment toward specific countries or locations, and to designate the direction, volume, and timing of financial flows. Financial actors often designate the conditionalities of such flows, reinvigorating the Global South’s financial dependency under a greener capitalism (Castree and Christophers, 2015). This constitutes what Newell and Phillips (2016: 42) describe as a dual ‘structural and material power wielded by these actors’ in which financial investment is wound up with ‘the discursive power to legitimise, validate and embed neoliberal models of transition.’

There are growing efforts to guide the direction of financial flows toward specific locations in the Global South and to signal the potential of investment accordingly, enrolling investors who may not be accustomed to these locations. Accounts of this process have outlined the ways in which investable locations are made visible while omitting other unpalatable components. McCarthy and Thatcher (2019: 242) detail how the World Bank used mapping exercises and databases to

make resources in Vietnam legible to states and capital for investment, affecting ‘who claims, uses, and controls rural lands and resources; how are competing claims contested and legitimated’ and who stands to win or lose. Characterization of sites in India as wasteland fueled the state’s push toward uses that they deemed as more productive (Baka, 2013), similar to the categorization of marginal land in Morocco to promote investment and stamp out opposing claims (Rignall, 2016)

These constructed narratives often center around what value these resources offer now, essentially interpreted as very little, and how they could be transformed to offer something more. Gidwani understands waste as ‘capitalist value-in-waiting’ while also ‘threatening its legitimacy and existence’ (Gidwani, 2013: 773). To signal that land is ready for utilization and investment, Li (2014: 592) finds ‘a new regime of distinction, in which a diverse array of land types in a great many places is homogenised and aggregated under a new label: their underutilisation.’ The power of such narratives is made clear by the fact that resources can also be ‘unmade’ when they continue to exist but are no longer deemed investable. As Li (2014: 600) explains, ‘the ground would still be there, but it would no longer be a global ‘resource’ of the kind that attracts investor attention.’ Le Billon and Sommerville (2017) usefully point out that there are elements besides narratives that have a lasting material effect, such as institutional changes and the operationalization of investments.

The transformation of nature into circuits of capital via the narratives described above is tied to trends of financialization. Financialization has been a defining factor of the energy transition globally, and to a growing extent in developing countries. When an economic sector undergoes financialization, financial channels become the new source of profit (Krippner, 2011) and productive activities are ‘translated into a financial value form to be traded in specialized markets’ (Ouma et al., 2018: 501). The prominence of finance in renewable energy infrastructure development is also understood as a form of rentiership in which financial actors tend toward capturing value rather than only creating it (Bridge et al., 2019; Knuth, 2015, 2018). Financialization itself has agency, ‘privileging financial parameters in decision making’ (Bracking, 2012: 274).

Tell-tale signs of financialization are the arrival of new financial instruments and financial engineering (Knuth, 2018; Ouma et al., 2018), and the fact that nonfinancial firms are increasingly dependent on income from financial activities (Fairbairn, 2020; Krippner, 2011). Equity shareholdings in solar and wind projects are often restructured and sold in financial markets as soon as a plant is operational, so that they ‘become divorced from their original purpose’ and result in ‘separation of ownership from responsibility and the separation of capital from the location from which it has profited’ (Baker, 2015: 155). While financialization has been slower to take hold across African countries besides South Africa (Klagge and Nweke-Eze, 2020), multiple Latin American countries are in an advanced stage of financialization (Correa and Vidal, 2012), and utility-scale solar and wind projects require significant up-front capital that necessitates financial instruments and actors capable of delivering large sums and long-term revenues.

While public sector debt was the driving force of infrastructure development prior to the 1980s (Baker, 2015), financialization has dominated in recent decades (Castree and Christophers, 2015; O'Neill, 2013), particularly through the project finance model. In project finance, a separate legal entity (special purpose vehicle) is used to secure capital for solar and wind plants while isolating financial risk from corporate balance sheets. While payments for electricity services generated by a project go to reimbursing lenders, equity investors and other project financiers expect the project to generate a return on investment (Baker, 2015). This means that to financiers, the provision of renewable energy is less important than the returns that the energy produces, because 'infrastructure services need to be commercialised to the extent that they generate competitive returns for private investors, thereby displacing infrastructure's non-commercial outcomes (O'Neill, 2009, 2013).

While financialization focuses on the subjects of financialization and the growing role that finance plays in the economy, the idea of assetization shifts the focus to the objects of that process. Birch and Muniesa (2020) point out that our current economic system can no longer be defined as one based on commodities, instead it is one in which assets are 'made.' In the conversion of commodities into tradable financial assets, assets are merely an 'abstraction and organizational form sufficient to bear debt' (Bridge et al., 2019: 734), rather than concrete objects produced for sale. But rather than a simple conversion of an object into a financial product, assetization is a relational process that creates an arrangement around the object to generate a revenue stream (Nadaï and Cointe, 2020). The result of these processes is a concentration of infrastructure ownership in the hands of global investors (Baker, 2015), and the empowerment of certain financial actors over others, which has consequences for the trajectory of energy transitions (Bridge et al., 2019; Mazzucato and Semieniuk, 2018).

This area of literature is valuable in incorporating the heightened interest of the financial sector in renewable energy production in the Global South, driven by the need for new locations to land capital. Financial channels have become the new source of profit in that the returns produced are more important than energy services themselves. Financialization offers capital a separation from both renewable energy projects as well as the specific context of those projects' locations, while assetization provides a conversion or abstraction of resources into financial units. Discourses emerge here as important vehicles for clearing away any obstacles to furthering these investment aims. To better understand how energy markets are constructed through these discourses, the next arena of literature looks at the intersection of cultural economy and energy transition.

1.2.3. Cultural economy and energy transition

Cultural economy approaches center the role of discourses and devices, which in this project is applied to the construction of energy markets. Foucault (1977) saw discourse as a method of control and discipline intersecting with knowledge. Drawing on Foucault's ideas about how government is accomplished, Bulkeley and Schroeder (2012: 751) offer that understanding how this applies to the climate change arena 'demands attention to the discourses/rationalities and

technologies of governing, and the ways in which projects (selectively) align and assemble diverse entities to achieve their aims, either directly or by ensuring the 'self-government' of relevant actors. This sort of 'green governmentality' (Rutherford, 2007: 294) is meant to 'strengthen the state through the exercise of tactics and the construction of knowledge rather than the imposition of law,' (Rutherford, 2007: 293) as well as the 'the construction of certain truths and their circulation via normalizing and disciplining techniques, methods, discourses and practices' (Rutherford, 2007: 293).

Attention to discourse in various aspects of energy transition often reveals distinctions from reality, demonstrating the intentions of those constructing the discourse. The cleantech sector came into being through 'discursive logics that justify and make sense of the cleantech sector for investor firms and governments alike,' including cleantech as a technological revolution and a technical solution to climate change (Caprotti, 2012: 370). There are discourses of digitisation and energy access around the achievement of SDG 7 that drive the off-grid solar PV sector toward more traditional models of capital accumulation (Baker, 2023). Knuth (2023) uncovers how mainstream narratives circulate about the uniform lowering of financing costs as renewables mature and are perceived as lower risk, contrasting with local realities. Disconnects have also been found between discourses that shape rural landscapes for renewable energy production and land use plans that do not reflect these discourses (Calvert et al., 2022). Both material and discursive elements are paired together, for example in the construction of the carbon finance market which is 'neither latent in material things (an inherent property, awaiting capture) nor a product of discursive claims (a projection onto the world)' (Bridge et al., 2019: 729). Instead, the 'commodification of carbon is a precarious achievement inexorably tied to both the means through which it is achieved and to carbon's materialities, and abstractions and calculations are central to ensuring carbon-as-commodity is able to bear value' (Bridge et al., 2019: 736).

While these various perspectives elevate the importance of discourse and the intersection of cultural economy and energy markets, calculative devices do the work of materializing markets. As Callon (1998a: 192) explained, 'Markets are not embedded in networks. In other words, it is not a question of adding social, interpersonal, or informal relations in order to understand their functioning. A concrete market is the result of operations of disentanglement, framing, internalization and externalization.' Market devices serve as 'calculative equipment' (Callon, 2009: 540) that bring a new market into being and that can affect significant change (Lovell, 2014). Much more than a numerical equation, calculation is a framing process that 'starts by establishing distinctions between things or states of the world, and by imagining and estimating courses of action' (Callon and Muniesa, 2005: 1231). The determinations made about whether a renewable energy project will take off, everything from grid connections to power purchase agreements, involve multiple and interwoven calculations (Bulkeley, 2015). Recent years have seen a proliferation of data and calculative processes that can turn solar and wind potential, project operations, and price support mechanisms into revenue projections (Bridge et al., 2019).

Commensuration aids in the calculative process by constructing a common metric, and 'the force of commensuration works by serving to simplify what it is that is assembled in order to

safeguard the smooth working of governmental programmes' (Bulkeley, 2015: 115). The process of 'making things the same' establishes new commodities that are 'made transferable and tradable' (MacKenzie, 2009: 443). The standardization facilitates comparison, setting boundaries to separate what is relevant and irrelevant, in order to arrive at uniformity regardless of diverse contexts (Preda, 2006). And the resulting abstraction creates a separation from political realities (Langley, 2008; MacKenzie, 2009), reducing any uncertainties that would be problematic for markets (Callon, 1998a). Bulkeley (2015: 116) points out that the creation of a common metric isn't limited to those elements that are easily or obviously knitted together. The process of commensuration includes the 'extent to which things do or can be made to agree, such that the techniques, practices and devices we might be concerned with move beyond those that seek only common metrics – critical as they are – and also include other means through which things are made to 'fit' with one another.'

While some elements are commensurable and are counted, many other aspects are not intended to be legible (Lansing, 2012). Calculative framing also excludes elements left as 'overflows' outside the frame (Callon, 1998b: 244). Calculative devices disguise what is not intended to be visible: 'what is there, and what could be there' (McCarthy and Thatcher, 2019: 250). The act of calculation is, in fact, made possible by those other elements deemed too ambiguous and complex to be calculated (Lansing, 2012). Devices such as maps and indexes that circumscribe resources such as energy (Castán Broto and Baker, 2018; McCarthy and Thatcher, 2019) and land (Li, 2014) deliver a visually striking confirmation of which factors should receive attention. For example, solar resource maps 'represent proposals for energy-related actions that contain alternative conceptualisations of space' (Castán Broto and Baker, 2018: 2).

Devices also serve to visibilize the assemblages through which government is conducted, contradicting a view of the state that is nationally bound or separated from private actors, (Bulkeley, 2015; Callon and Muniesa, 2005). Devices of market governance align people, objectives, and technologies (Loconto, 2015), merging abstract and material heterogeneous elements. In the context of an energy market being constructed, multiple actors and elements are involved, rather than a single law or government office. Lansing (2012: 217) describes a carbon market as an 'ongoing articulation between the abstract and the material' that merges various actors and objects in a particular location. Devices expand or restrict the capacity of actors to participate (Hatanaka et al., 2005), delivering legitimacy to certain actors over others (Cid Aguayo and Barriga, 2016). Such devices have 'changed how market participants act in relation to each other and to markets, and also how they think about markets' (Beunza et al., 2006: 722).

While devices are made for a specific purpose, the Foucauldian concept of *dispositif* can address a broader system of relations. Sometimes understood as a governance apparatus, the idea of *dispositif* is useful in examining 'how governance capacity is composed and cohered' around 'emergent, distributed and extra-state ecosystems' (McGuirk and Dowling, 2020: 24). A *dispositif* is formed from the coherence of diverse elements in complex and fluid ways (McGuirk and Dowling, 2020), securing 'forms of attachment and engagement' by multiple actors (Stripple

and Bulkeley, 2019: 58). Braun (2014) notes that Deleuze described an apparatus composed of lines, but these lines are different from one another, tangled, broken, changing in direction, and drifting. In characterizations of similar 'emergent processes' that 'realign and reorder socio-material relations in new sites and domains across the urban fabric,' these 'are not going to be created through any kind of linear blueprint' (Stripple and Bulkeley, 2019: 54). As power and capacity changes within the *dispositif*, the actors themselves change, and thus their relevance to the overall *dispositif*.

There are a range of interpretations of the concept of *dispositif*, but it is generally understood to be distinct from assemblage due to the presence of a degree of power over (Agamben et al., 2009; Fredriksen, 2015) 'entrained subjects' (Bracking, 2019: 715). In this vein, Pløger (2008: 52) emphasizes that Foucault's original understanding of *dispositif* was as a vehicle for the 'constitution of disciplinarian forces through relations of power, knowledge and space,' while Legg (2011: 131) describes *dispositif* as a type of assemblage that is 'more prone to…re-territorialisation, striation, scaling and governing.' Agamben (Agamben et al., 2009: 3) seems to take this further, suggesting that the *dispositif* is a form of entrapment where there is a strategic function that deceives or forces actors into contributing to the *dispositif*'s purpose (Fredriksen, 2015). In this way, a *dispositif* is 'always located in a power relation,' more so than the concept of assemblage (Agamben et al., 2009: 3).

The lens of *dispositif* helps to uncover not only the form but also the impetus for relationships forming, essentially a framing that emerges in response to a problem. Foucault (1980) used the idea of *dispositif* to understand a heterogeneous 'formation... that at a given historical moment has as its major function the response to an urgency.' Framing the arena of intervention (Li, 2007) helps to 'shape the ways it can be navigated and its emergent possibilities' (Stripple and Bulkeley, 2019: 58). Callon explained that bounding a problem helps actors who have a stake but can't move forward due to various obstacles in their way, and 'offers the prospect of removing these obstacles and enabling an alliance to proceed' (Ascui et al., 2018: 912). This problem framing importantly includes actors beyond the state, and state power that can be more broadly understood to include 'persuasion and inducement' and 'operation across varied cohering processes' (McGuirk and Dowling, 2020: 23).

These accounts of the construction of markets through discourses and devices demonstrate the powerful framing involved in efforts to transform people and places into calculations. Devices visibilize assemblages that merge abstract and material heterogeneous elements. And the process of making things the same for the purpose of creating a market leaves any overflows outside the frame. These perspectives demonstrate that discourses and devices are powerful methods for financial actors and the state to create markets. While the literature in the previous three sections covered political economy, directions created by financial actors, and cultural economy perspectives on market-making all of which are applicable across multiple scales, the unique experience of governance at the subnational scale deserves a dedicated treatment, via literature on urban political ecology and urban climate finance covered in the next section.

1.2.4. Examining the urban scale

Understanding energy market-making across multiple scales necessitates delving into literature on inequities and tensions that exist in urban governance. By some accounts, 'energy transitions always work at least partly through urban processes' (Rutherford and Coutard, 2014: 1354). But cities face a wide range of obstacles to enact climate adaptation and mitigation actions, spanning from a lack of municipal capacity or financing or support from national or international entities (Anguelovski and Carmin, 2011), and research in this arena has focused on mechanisms that support cities to overcome these obstacles. Networks have helped cities learn from one another or access international opportunities (Castán Broto, 2017) and numerous experimental transnational governance initiatives have been established to address climate change including involvement of cities in the Global South (Bulkeley et al., 2012). Cities have pursued climate change experiments by 'establishing new circuits, configuring actors in new sets of relations' (H Bulkeley et al., 2014: 26). This section considers urban political ecology and urban climate finance to contextualize the role and power of urban environments.

Urban political ecology is relevant to this research through its examination of the (un)equitable distribution of power in the production of urban environments, and the tensions inherent in multi-level climate governance. The broader realm of political ecology 'offers a distinctive approach to understanding conflicts over resources and environmental change, because it is historically grounded, field-based, and generally engages with both the structural and social dimensions of uneven power relations' (Le Billon and Duffy, 2018: 242). The urban lens of political ecology is often related through concepts of metabolism and circulation. Exchanges between nature and societal elements are described as 'metabolic circulatory flows, organized through social and physical conduits or networks' (Swyngedouw, 2006: 22). This lens helps convey the interconnectedness of human and non-human systems, as cities are part of nature and 'power-laden socio-ecological relations that go in the formation of urban environments constantly shift between groups of human and non-human actors and of spatial scales' (Heynen et al., 2006: 16). Social relations, nature, and capital flows are all materially transformed in the production of urban spaces. As Silver (2015: 986) notes, 'nothing lies outside of these transformations and the city is a part of these huge networks that span across the local through to the global, incorporating human and non-human actants, which include everything from capital to the wires themselves to the flows of electricity to communications on energy policy.'

Urban areas are shaped by climate-related interventions, in an 'unbounded expanse of metabolic exchange' (Arboleda, 2016: 247), but the influences don't flow in only one direction. (Castán Broto et al., 2018) Broto (2017: 2) sets up a dichotomy between the 'deep changes in urban governance that follow attempts to address climate change and how, in turn, attempts to govern climate change in urban areas reconfigure discourses informing the politics of climate change.' These connections are prominent enough that in urban areas, 'climate change has already refashioned the possibilities and consequences of climate-oriented urban development' (Castán Broto, 2017: 2). These multi-scale exchanges are grounded in the concept of multi-level governance, which captures the fact that 'political authority and processes of policymaking cross traditional divides between state and non state actors, domestic and international spheres' and

acknowledges that ‘environmental problems are governed within and across scales’ (Betsill and Bulkeley, 2006: 149) rather than at a singular scale. In reality, climate governance involves multiple urban actors beyond just local governments and ‘involves plural modes of governing, which act to reinforce and negate each other’ (Betsill and Bulkeley, 2006: 153).

Transformations across these scales prompt disruption. Urban experiments can become ‘sites of conflict, a means through which new forms of urban circulation can be confined and marginalised, leaving dominant energy regimes (relatively) intact’ (H Bulkeley et al., 2014: 26). In their examination of conflicts surrounding the spatial implications of urban energy infrastructure in Chile, (Castán Broto et al., 2018) Broto and Sanzana Calvet (2020: 296) find that fossil fuel infrastructure introduces ‘a competing mode of being urban.’ The fragmentations of the city of Concepión’s landscape ‘reflect the coexistence of energy infrastructure and associated industries, with daily activities of communities that have little to do with such industries but live in their shadow’ (Castán Broto and Sanzana Calvet, 2020: 295). They point to capitalist accumulation and its ‘thirst for energy’ as the driver of these competing uses of urban space (Castán Broto and Sanzana Calvet, 2020: 282). For the cities that must prioritize structural vulnerabilities, a tension also exists between transformative actions that disrupt structural norms and the drive to secure practical mitigation and adaptation actions (Castán Broto, 2017).

Literature on the geographies of urban climate finance also provides important framing for understanding energy transition at the subnational scale. Cities in the Global South and emerging economies are increasingly viewed as new frontiers for global finance, due to an ‘overabundance of stagnant Northern capital in search of returns’ (Bigger and Webber, 2020: 1). An emerging literature focused on cities in the Global South shows how they are increasingly ‘sites and targets of financialized global development and climate agendas’ that simultaneously advance both green finance and municipal finance (Hilbrandt and Grubbauer, 2020: 1417).

The ideal city for relocating investments in the Global South is imagined by Hilbrandt and Grafe (2022: 898) through the fictional story of Groy produced as an ‘emerging-market city,’ which is not far off from the vision surrounding the non-fictional Renca. Interventions intended to channel investment in cities like these tend to map out opportunities, obstacles, and policy recommendations so that cities are ‘decoded’ to turn them into Groys (Hilbrandt and Grafe, 2022: 898). Bigger and Webber (2020: 1) describe efforts to transform policy architecture as a process of Green Structural Adjustment in which city governments are ‘reformatted in investment-friendly ways’ to ‘unleash entrepreneurial development.’ These acts of ‘establishing a logic of formalizing and deploying actionable solutions’ are part of futuring mechanisms used to project a ‘highlight financialized urban future that is carefully summoned by a few key institutions’ to ‘meet finance’s inherent desire to extract profits’ (Hilbrandt and Grafe, 2022: 901).

This process of reformatting individual cities to capture global investment is a step toward building a broader market and ensuring the ‘stickiness’ of global finance in cities. Grafe et al (2023: 10) describe a ‘larger financial ecology of climate urbanism’ built from the tying together of the actors, locations, and relations that make up smaller financial ecologies. When a regional

office of a global institution is established in a country, local cities are brought into the financial ecology of that global institution. The anchoring of global financial capital in a country relies on the existence of 'anticipatory marketization' (Bernards, 2022: 950), a logic built on the expectation of a functioning market that will emerge. This anchoring is helped along by 'preparing the ground for market activity *in hopes that it materializes*,' specifically through the development of a project pipeline and technical assistance to support project rollout (Bernards, 2022: 961). This may involve a 'proof of concept' (Grafe et al., 2023: 8) of the investability of infrastructure projects, for example through the preparation of feasibility studies for energy projects. While not all projects receive funding, the process of project pipeline development serves to 'establish a dominant narrative and a modus operandi' around what is investable, and cities often do not have other alternatives (Grafe et al., 2023: 10). The anchoring process ends up prioritizing 'stable revenue streams that are attached to ring-fenceable green infrastructure developments' rather than basing investment decisions on climate risks (Grafe et al., 2023: 11) or integration into broader city planning (Hilbrandt and Grafe, 2023).

This inherent divide between what global capital requires and what municipalities need perpetuates existing inequalities, between the North and South, but also between urban spaces through the deepening and expansion of extraction zones (Hilbrandt and Grafe, 2023). Municipal investment is 'framed as a mechanism for enabling sustainable transitions, but it is structured through existing racialized geographies of inequality' (Bigger and Millington, 2020: 616) and often funds projects that 'reinscribe existing inequalities in the city' (Bigger and Millington, 2020: 601). This has the effect of building a channel for finance along a well-trodden path toward certain municipalities, rather than veering from that path. Investment thus ends up resembling a 'cluster around a limited number of locations, rendering sites exclusive spaces with exceptional access to resources and expertise.' Those municipalities along the path then tend to receive attention and investment, 'like a cascade.' Under-resourced municipalities are left 'doubly disenfranchised' by climate risks and a lack of financing to address those risks, furthering inequalities between municipalities (Hilbrandt and Grafe, 2023: 13). Meanwhile only a small number of wealthy cities are in possession of the 'financial, institutional, and technical resources to map, manage and respond to climate risks' (Castán Broto and Robin, 2021: 715).

Responses to climate change have a direct impact on the formation of urban environments, and climate change and its governance 'demands a rethinking of what it means to be urban' (Castán Broto and Robin, 2021: 715). As a newer development paradigm, climate urbanism seeks to protect urban economies and infrastructures from climate impacts, an approach couched in neoliberalism that inherently exacerbates inequities and injustices (Long and Rice, 2019). However, Robin and Castán Broto (2021: 717) find limitations in this framing of climate urbanism. They demonstrate how 'post-colonial scholarship can support the development of more plural and, perhaps, more hopeful, theorizations of urban responses to climate change' (Robin and Castán Broto, 2021: 870). They point to those climate actions that are less visible, not led by governments or financial institutions, not steeped in neoliberal strategies, and not focused on US and European cities. Their argument pays attention to cities in the Global South or places globally that share characteristics of such cities, and particularly urban infrastructures

that are ‘being made, remade and maintained through multiple practices of everyday living’ (Robin and Castán Broto, 2021: 872).

Given the disconnect between municipal and global investment goals, a question emerges about the extent to which the needs of municipalities and global finance could be closer aligned. Webber et al. (2022: 936) examine the idea of reparative climate infrastructures that move toward equitable resource redistribution over time. Each case they review ‘engages strategically with a marketised terrain to prefigure something durable, while providing stop-gaps now’, essentially reducing negative impacts in the short-term to allow for more transformative policies in the longer term. They understand this reparative approach as involving the ‘strategic power of small-scale changes that foster conditions for systemic transformations’ and ‘redistributive social impacts’ (Webber et al., 2022: 950). This is in contrast to ‘reparative accumulation’ in which finance is offered ‘as a benevolent purveyor of solutions to the very social and environmental problems that capitalism has historically created while mobilizing those solutions to generate profits’ (Cohen et al., 2022: 2357). One important framing for the more transformative version of repair comes from the abolitionist movement. ‘Repair in this vein is… not focused on sustaining the function of existing systems, but (going further) on their undoing; what is to be repaired here are the relations, institutions, and places that have been eroded or destroyed through colonisation, slavery, capitalism, and their associated carceral systems’ (Webber et al., 2022: 937). In a similarly optimistic mode, and cautioning against complete condemnations of the role of capital, Castree and Christophers (2015: 381) point to the fact that financing is required even for small-scale infrastructure. They suggest that we shouldn’t rule out the possibility that capital switching can be reoriented toward ecological purposes. Financial incentives, they argue, could be transformative enough to ‘reconfigure capitalism’s operating “hardware” along more ecofriendly lines.’

1.2.5. Synthesizing literature across scales

The literature reviewed above helps to account for key dynamics of energy transitions and market-making explored in this project. In particular, existing research findings demonstrate that understanding energy transitions in the Global South necessitates an examination across multiple scales. This section synthesizes which areas of literature are most instructive for each scale, including the ways in which the literatures are complementary at each scale.

When considering the key dynamics of energy transitions that this project explores, it is clear that investigations initiating from the regional scale require an understanding of directions created by global financial actors as well as cultural economy approaches. Although financial directions and discourses may initiate at a global or regional scale, both of these conceptual arenas demonstrate that financial directions and discourses are ultimately destined to be trained toward and influence other scales. The literature review above unearthed the tremendous power of financiers, their continual search for new places to anchor capital, and the turn toward financial channels as the new source of profit rather than traditional commodities such as energy services. The literature highlights a swath of examples in which global investment

interests are increasingly divorced from local interests. Cultural economy literature complements this reality by highlighting that financial actors don't just wield power with financial transactions. They also employ discourses to seek new locations and construct new markets, which uncovers a more nuanced understanding of their power. To secure new locations for capital, financial actors wield control and discipline by constructing discourses, a process of governing that aligns diverse material and discursive elements into a narrative that carries its own power. Financial actors are highly selective in the elements included or excluded in the discourses they construct, assigning investable locations and elements as more visible while moving unpalatable ones out of view. Cultural economy literature also highlights the conversion and narrowing of complex energy systems into quantities and comparisons that investors can more easily grasp. Financial actors construct powerful discourses and create new energy markets by calculating and creating abstract uniform metrics that do not need to align with reality. This pairing of scholarly work on the power of global financial actors with how they use discourses to construct energy markets is thus essential to the conceptual framework, framing investigations of discourses that may start outside of Latin America but are used to generate an investment boom in Latin America.

Turning to the national scale, the cultural economy literature reviewed above remains equally relevant, particularly in the material and discursive elements of the state's procurement mechanism for renewable energy generation infrastructure, while literature on political economy greatly aids in understanding the role of the state. Bringing to light the importance of both structure and agency, political economy literature helps to bridge across the scales of this project, highlighting the ways in which the structural power of global capital influences and intersects with processes led by the central state at national and subnational scale. In many ways, the political economy literature highlights how state and capital operate in a close relationship and are aligned in their commitment to building markets. This relationship is strengthened by the fact that the state tends to favor incumbent actors, while those actors simultaneously work to maintain their power. However, while the state is largely beholden to market-based and globally-derived channels for energy transition, it is not always subsumed by the interests of financial actors and sometimes pushes back with opposing interests. The state has tremendous agency and also wields a structural power, but the literature also helpfully highlights the dispersed nature of its power, providing a more realistic picture of its capacities and close linkages to transnational actors and linkages across scales. In alignment with the disciplinary power of financial actors wielding discourses that construct energy markets, inclusion of cultural economy approaches highlights the state's use of discursive approaches to frame investability in ways that match investor interests. In these ways political economy and cultural economy literature provide a complementary understanding of why the state aims to reduce energy systems to a standardized framing for international investors in its development of a national energy market.

Within the context of the other scales, literature focused on urban environments provides critical insights into how processes at the subnational scale intersect. While literature on urban political ecology points to power inequities particularly in the context of multi-level climate governance, urban climate finance literature helpfully explains the way in which cities in the Global South and

emerging economies are increasingly viewed and characterized as new frontiers. Driven by global financial interests, both financiers and the national state are engaged in reformatting cities for investment, tending to channel finance along a well-trodden path to certain municipalities. While urban climate finance literature explains how finance travels and is guided across scales, literature from the arena of cultural economy again is essential in articulating the nuanced ways that governance capacity is formed and inequalities are structured across those scales. The cultural economy literature is again useful here in unearthing the intricacies of relationships across scales and how that impacts urban environments. The lens of *dispositif* offers an opportunity to better understand the institutional relationships that emerge around a frontier city, and particularly the power differentials between diverse elements and across scales within the *dispositif*. Urban climate finance literature alongside literature on the concept of *dispositif* is thus critical in the conceptual framework to center the needs of local energy transition processes and how those are influenced by processes emerging from other scales.

1.3. Conceptual framework

Centering the importance of a multi-scalar approach to understand energy transitions in the Global South, the conceptual framework draws on the above historical geography of Chile and literature review to shape an investigation of how markets are made. Each area of literature explored above, as well as Chile's historical experience leading up to present-day energy governance, demonstrates that examining processes occurring at a singular scale does not provide a complete enough picture. With the aim of advancing this scholarship, this thesis seeks to demonstrate the value of a multi-scalar approach by outlining the complexities and dispersed power relationships that exist at each scale while linking to other scales. The conceptual framework is thus designed to support a contribution that is both methodological and conceptual in nature, and to argue for attention to dimensions of energy transition and market-making that are often neglected.

The first component of the conceptual framework builds on political economy literature explored above in Section 1.2.1 to understand the role of the state and its structural power and agency. This area of literature documents the close relationship the state maintains with capital in energy transitions (Baker, 2015; Bridge et al., 2013; Harvey, 2003; Newell, 2014), a useful starting point for investigating this relationship across scales in the context of Chile's energy transition. This literature also characterizes this relationship as close but wavering. The state tends to favor incumbent actors (Baker, 2015; Baker et al., 2014; Power et al., 2016) while financial actors work to maintain their power in parallel (Baker et al., 2014; Newell and Paterson, 1998; Newell and Phillips, 2016; Paterson, 2010; Power et al., 2016). Though largely reliant on market-based approaches to facilitate energy transition, the state has also been at the forefront of contradicting investor interests (Baker, 2015; Bridge and Frederiksen, 2012; Newell and Phillips, 2016). The role of the Chilean state in governing the country's energy systems has been constrained by market deregulation and privatization introduced in the Pinochet era, in alignment with global financial interests. While the Bachelet administration strengthened the state's control of investment directions, and introduced mechanisms to increase renewable

energy and address subnational governance, the neoliberal paradigm favoring investment interests has remained in place. Governmentality approaches are equally relevant to understanding the Chilean state's power, which is not limited to a singular autonomous entity (Bulkeley and Schroeder, 2012; Ekers and Loftus, 2008) or bound to a singular scale. Instead, its role and its power can be seen as a 'multiscalar institutional ensemble' (McGuirk, 2004: 1019) as well as dispersed, experimental, and assembled (Bulkeley and Schroeder, 2012; Langley, 2018: 173). The dispersed and unsettled nature of state power is particularly relevant to urban governance (Bulkeley and Schroeder, 2012), which is understood to be unsettled and 'not necessarily connected to a single overarching plan, central logic, or centralised steering capacity' (McGuirk and Dowling, 2020: 2). Viewing the trajectory of Chilean energy governance through the lens of political economy maintains a focus on both agency and structural parameters in examining the state. It also facilitates an understanding of the dispersed and multi-scalar state and its ever-evolving interwoven relationship with financial actors.

The second component of the conceptual framework, drawing from literature reviewed in Section 1.2.2 above, centers on how broader financial structures influence and interact with Chile's process of energy market-making. Chile's neoliberal history can be traced to the power of global financial actors and the directions they create toward investment in the Global South. Examinations of these trends in the literature highlight the surging role and power of finance (Bracking, 2019; Castree and Christophers, 2015; Ouma et al., 2018) and efforts to remove blockages to the circulation of capital (Ekers and Prudham, 2017; McCarthy, 2015; Ouma et al., 2018) in order to enroll new elements (McCarthy, 2015). Pinochet's constitution, a prime example of the influence of these trends, handed governance of the country over to the market and centered private delivery of essential services. Chile thus emerged as a poster child for financial channels overtaking productive activities as the source of profit, which has extended to the country's approach to financing energy infrastructure. Literature on the role of financial actors also focuses on discourses used to mobilize investment in certain directions (Castree and Christophers, 2015; Newell and Phillips, 2016). Investable locations and investable elements of energy systems are made visible while other elements are hidden (Baka, 2013; Li, 2014; McCarthy and Thatcher, 2019; Rignall, 2016). These efforts of financial actors have led to the ascendancy of financialization in Chile and Latin America, including in the energy sector where financial channels rather than energy services have become the source of profit (Bracking, 2012; Krippner, 2011; O'Neill, 2013; Ouma et al., 2018) and value is being captured rather than created (Bridge et al., 2019; Knuth, 2015, 2018). The role that financial actors play in driving the financialization of Chile's energy systems calls for an approach that examines these factors across multiple scales.

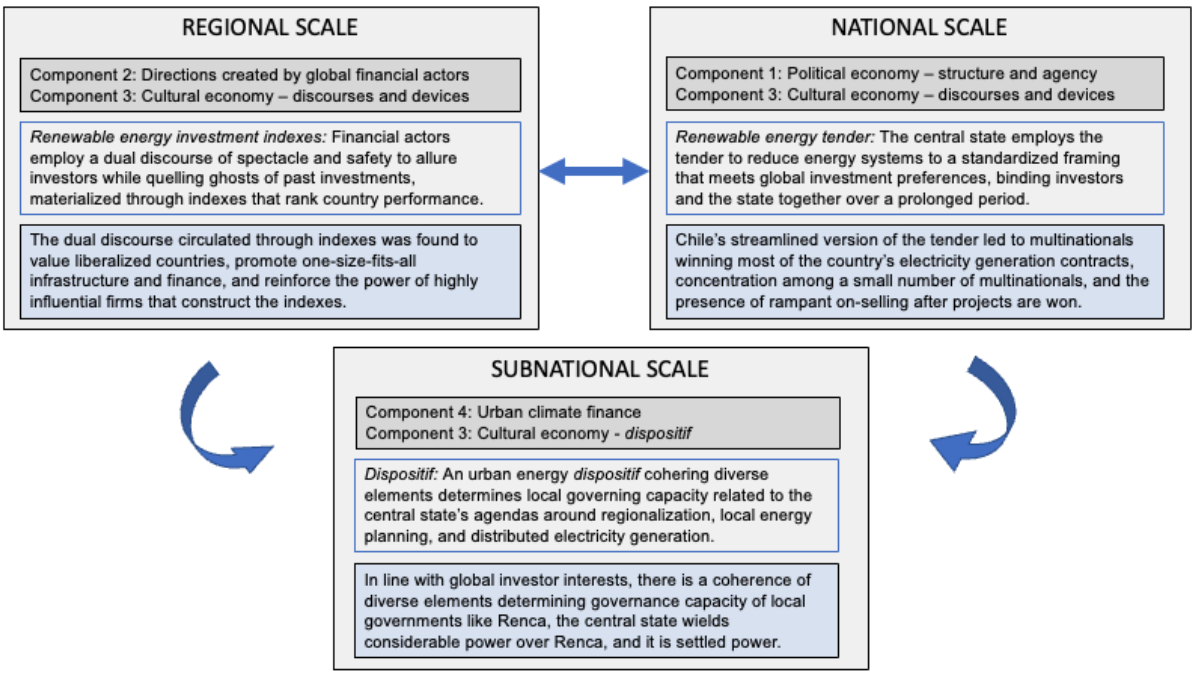
The third component of the conceptual framework, drawing from literature reviewed in Section 1.2.3 above, incorporates cultural economy approaches, including market-making discourses, devices, and assemblages. One of the modes by which financial actors and the state express power is through discourses and calculative devices that aid in construction of energy markets. Examining discourse as a method of control and discipline (Bulkeley and Schroeder, 2012; Foucault, 1977) helps uncover this lesser understood but powerful aspect of governing and market-making. Market devices facilitate a calculative framing that converts all aspects of

energy systems into potential profit (Bridge et al., 2019; Bulkeley, 2015; Callon, 2009; Callon and Muniesa, 2005), while commensuration aids in the process of abstraction from reality and establishment of tradeable uniform metrics (Bulkeley, 2015: 114; Callon, 1998a; Langley, 2008; MacKenzie, 2009). These discursive framings and the devices that carry them create a division between aspects of energy systems that are to be included or excluded (Callon, 1998b: 244; Castán Broto and Baker, 2018; Lansing, 2012; Li, 2014; McCarthy and Thatcher, 2019) and bring attention to the assemblages of abstract and material elements that are involved in market-making (Bulkeley, 2015; Callon and Muniesa, 2005; Lansing, 2012; Loconto, 2015). Drawing on this literature, this thesis applies cultural economy approaches to each scale, identifying discourses and devices designed to construct energy markets in Latin America, in Chile, and in the *comuna* of Renca. Global financial actors use renewable energy indexes to deploy a discourse of investability around the Latin America region's renewable energy market. The Chilean central state uses a device, the tender, to attract global investors and procure utility-scale infrastructure. And at the subnational scale, a coherence of diverse elements form a *dispositif* (Agamben et al., 2009; Bracking, 2019; Foucault, 1980; Fredriksen, 2015; McGuirk and Dowling, 2020) in which global financial actors and the central Chilean state wield power over a local government's self-determined energy vision. Centering market-making discourses and devices shines a light on the dispersed, multi-scalar, and relational power that is often neglected in examinations of energy transition.

The fourth component of the conceptual framework, drawing from literature reviewed in Section 1.2.4 above, responds to the positioning of subnational entities in Chilean energy governance, particularly concepts around urban climate finance. While urban political ecology is relevant in its surfacing of the inequities present in the production of urban environments and tensions inherent in multi-level governance, this thesis does not delve into the metabolic elements of urban energy transition. Urban climate finance is a central focus, as it provides a useful framing of Renca's plight to finance its energy vision within the national and global context. Cities in the Global South and emerging economies are increasingly viewed as new frontiers for global finance, subject to reformatting and decoding in order to land global investments (Bigger and Webber, 2020; Grafe et al., 2023; Hilbrandt and Grafe, 2022; Hilbrandt and Grubbauer, 2020). Market-building activities aimed at anchoring global finance such as feasibility studies and technical support are efforts of 'anticipatory marketization' paving the way for investment (Bernards, 2022; Grafe et al., 2023), which happens to be a strong rationale for discourses created by financial actors and the central state. Efforts to align cities with global investment interests deepen existing inequalities and experiences of extraction (Bigger and Millington, 2020; Hilbrandt and Grafe, 2023), leading to the further disenfranchisement of under-resourced municipalities (Hilbrandt and Grafe, 2023). This literature on the inherent divide between what municipalities need and how global financial actors and the central state construct energy markets is important framing for the examination of the subnational scale. From its early history through to the Pinochet dictatorship and present day administrations, Chilean governance has been centrally concentrated, while subnational entities carry limited authority and face significant financial constraints. Renca's attempts to realize its unique energy transition vision is a prime example of the constraints imposed on local authority by global financial actors seeking to secure investments with the support of the central state.

These conceptual elements that assist in understanding the Chilean case lead to a framework for investigating how markets are being made for energy transition, which is visualized in Figure 1.1. Drawing on political economy literature highlighting the structural power of capital, the actions of global financial actors are closely interwoven with those of the Chilean central state. Global financial actors create investment directions that designate investable locations and elements, and they along with the central state use market-making discourses and devices to further this agenda. As an extension of this model, urban climate finance literature shows how municipalities are cast as a new frontier for global finance and reformatted to fulfill this purpose. To understand how this plays out at the subnational scale in Chile, the concept of dispositif allows for an examination of how multiple actors and elements align to enable or constrain local authority.

Figure 1.1: Conceptual framework



Under the umbrella of this conceptual framework, the thesis aims to advance the overarching argument that adopting a multi-scalar approach facilitates a more authentic understanding of energy transitions in the Global South. The contribution is both methodological and conceptual, investigating the intricacies of market-making at each scale and across scales, and thus demonstrating the value of highlighting power differentials and relationships through this more expansive lens. With the aim of understanding how the various components of the conceptual framework come together and interact across scales, the thesis examines the complexities of

market-making via research questions as outlined below aligned with the regional, national, and subnational scales.

Regional scale:	*How do financial actors create investment directions in the Global South?*
National scale:	*What is the role of the central state in making energy markets and attracting investment?*
Subnational scale:	*To what extent are subnational actors able to determine their own energy future?*

1.4. Structure of thesis

Following this introduction, the second chapter provides an overview of the methodology, which is organized around nested regional, national and subnational scales to facilitate an examination of the complex processes that occur beyond any one scale. Rather than thinking about scale as only a simplistic hierarchical structure, this structure is used to understand the relational and dispersed elements occurring at and between the regional scale of Latin America, the national scale in Chile, and the subnational scale in the municipality of Renca. This scalar approach also afforded the opportunity to consider the Latin American region as a whole through the eyes of investors contributing to and responding to the renewable energy boom. Though the research questions were initially organized as inquiries directed at each scale, the continual overlaps and interconnections that emerged between them validated the multi-scalar approach. These examinations were undertaken through interviews and participant observation conducted in Chile, as well as document analysis and collection of tender data. In that process, considerations were included about positionality in relation to research in the Global South and other research design choices that aimed to avoid an extractivist approach, as well as how having a background with international organizations, working in Latin America, and being an active parent in fieldwork influenced the research.

The third chapter focuses on the regional scale and delves into the question of how financial actors create investment directions in the Global South. The chapter looks at the construction of Latin America, and particularly the emerging economies within it, as an investable and desirable frontier for utility-scale renewable energy development and investment. The regional renewable energy boom reinvigorated long-established processes of dependency and financialization, while concentrating investment among a small number of private transnational financial institutions. This chapter employs a cultural economy lens to identify the discourses and devices that helped to create new waves of regional renewable energy investment. These discourses are materialized through renewable energy investment indexes, constructed by professional services firms to direct their powerful corporate clients toward countries deemed more

investable. Analysis of these indexes points to a dual discourse of spectacle and safety that allures investors with the idea that solar and wind energy are Latin America's new 'gold' while also working to put the ghosts of past investments to rest. The chapter aims to shed light on the growing influence and intricate power of the global financial sector and potential consequences for the trajectory of energy transition, including the extent to which regions and countries will determine their own energy futures.

The fourth chapter turns to the national scale, examining the role of the national state in making energy markets and attracting investment. The focus of this chapter is the device many states use to attract investors, the renewable energy tender. Implementing the world's purest version of this device, Chile's tender reveals the state's market-centric intentions for the country's energy transition. While other countries have attempted to deliver on other elements of energy transition in their tender design, such as local workforce and economic development, Chile's design solely prioritizes the price of bids. The chapter first provides a backdrop exploring how market-making devices have transformed the state's role in energy transition, looking at the relational nature of the state, the assemblage of the material and the abstract in energy systems, and elements of calculation and growing financialization. The chapter then explores the shift in state control of the tender system and considerations for attracting investors, and delves into the resulting material elements of the Chilean tender, including performance of the bidding process that narrows the field of contenders, an algorithm that carries the intention of the state to prioritize certain types of companies, and long-term contracts that bind the state to these companies over decades. Analysis of Chile's tender results during 2015-2020 reveals the effect of these material elements. Non-Chilean companies have been awarded most of the country's electricity generation, contracts have been concentrated with a small number of multinationals, and on-selling is rampant. The pattern of ownership and presence of regular on-selling reaffirms the prominent role of financialization and centralized governance in the country's electricity system. More broadly, this chapter reveals the essence of the tender, which is to reduce energy systems to a standardized framing that is friendly to multinational companies and to bind a narrow category of investors to the state over a prolonged period of time. In short, the tender is unbendable for purposes beyond market creation and can only deliver the cheapest and narrowest route to energy transition.

The fifth chapter examines the question directed at the subnational scale, the extent to which subnational actors are able to determine their own energy future. Through the lens of the *comuna* of Renca's pursuit of local energy initiatives, the chapter explores the ways in which the local came to matter in the country's energy transition, as well as the possibilities and limits of municipal power in pursuing a locally-driven energy agenda. Exploring governance capacity through the Foucauldian concept of dispositif helps unpack the relational configurations between the national and subnational scales. In response to multiple crises of energy supply and public outcry over the Chilean state's approach to energy systems, new national agendas emerged that emphasized linkages with local energy needs. The chapter is organized around these agendas of regionalization of energy governance, local energy plans, and distributed electricity generation, and how these played out with Renca. Hosting the country's most polluting power plant positioned Renca as a 'sacrifice zone,' thus driving an interest in engaging

with these agendas to center the needs of comunas. Renca's local energy plan offered an alternate vision of municipal leadership on sustainability and innovation, and its pursuit of a district energy system sought to transform its relationship with the power plant and other companies in its industrial zones. The chapter examines evidence of the dynamics of an urban energy dispositif, including the coherence of diverse elements that generates capacity to govern, the existence of *power over* Renca's municipality, and the extent of settled power. The chapter concludes by exploring the implications of this dispositif for Chile's energy transition, and the prospects of a municipality like Renca setting the terms of its energy future.

The sixth and concluding chapter brings together the conceptual framework with the empirical findings, highlighting key contributions and situating the project within the broader literature and policy landscape. The chapter outlines the project's key contributions to the literature based on findings at each scale. This includes how global financial actors create investment directions in the Global South, the role of the national state in making energy markets and attracting investment, and the extent to which subnational actors are able to determine their own energy future. At the regional scale, component 2 of the conceptual framework on the directions of financial actors was salient. At the national scale, component 1 of the conceptual framework on political economy was important framing. And the subnational scale was framed by component 4 of the conceptual framework on urban climate finance. Across all three scales, component 3 of the conceptual framework on cultural economy was employed in distinct ways to understand how discourses and devices advanced directions and facilitated relationships across scales. This is followed by a discussion across these scales, exploring whether local visions of energy transition are realizable. The chapter then delves into policy implications focused on each scale, including new modes of energy generation procurement, fiscal decentralization, and decoupling financialization from energy systems governance. The final two sections discuss limitations of the conceptual framework and data collection, and future research areas.

2. Methodological approaches examining energy market-making in the Global South

This chapter presents the research methodology, starting with an overview of the methodological structure of nested scales infused with a relational approach. The second section provides background information on each of the scales in question, the Latin American regional scale, the Chilean national scale, and the subnational scale focused on the *comuna* of Renca. The third section outlines the data collection processes, including interviews, participant observation, and document analysis, and the fourth section covers data analysis. The fifth section considers positionality and ethical considerations, as well as limitations, followed by summarizing the chapter in a sixth concluding section.

2.1. A nested multi-scalar lens

The overarching argument of this thesis is that understanding energy market-making in the Global South requires an examination across multiple scales in order to unearth the intricacies of relationships and power differentials that are not always revealed by looking at a singular scale. Thus, the primary methodological structure is designed to respond directly to this multifaceted reality. A nested multi-scalar approach allowed for a fuller understanding of dynamics at the regional, national, and subnational scales while also capturing the ways in which these scales are inherently interdependent.

Rather than using scale as a static vertical structure separating distinct processes that are either regional, national, or local, the research design is infused with a focus on interdependencies and relational elements. The thesis demonstrates the methodological value of focusing on scalar and relational approaches simultaneously (MacKinnon, 2011), necessitated by the complex multi-scalar processes of change (Jonas, 2006) involved in market-making around energy transition. The state's power is not isolated at one scale, but rather involves a multitude of relationships with a variety of actors across scales, which requires a broader interpretation accounting for its dispersed reach and authority(Betsill and Bulkeley, 2006). A multi-scalar lens offers a window into 'territorial hierarchies' in which the state and financial actors are embedded (Jonas, 2006: 400), the dependencies and interrelations that exist (Gustavsson et al., 2009; Swyngedouw, 2004), and the shifts that continually evolve over time (McMaster and Sheppard, 2008). It is highly valuable to examine the ways in which a phenomenon like energy market-making influences or is channeled over multiple scales and also to be able to consider each scale in parallel (Bridge, 2018: 14).

Though the research questions were initially organized under each scale, there was overlap and interconnections between them. I identified discourses in indexes that measured country performance at the regional scale and then found similar discourses repeated in meetings attended in Chile to understand the national scale. While some interviews provided insights squarely within one scale, others offered insight into research questions articulated in multiple

scales. For example, staff of the Energy Ministry were initially categorized under the national scale but they offered important commentary about the role of subnational and regional or global actors. The same was true for subnational authorities who provided critical insight into the shaping of the national energy transition. With these sorts of results emerging, it seemed impossible to examine climate governance without a multiscalar and relational approach.

The relational scalar approach also provided me with the ability to consider and attempt to characterize the region as a whole. The regional scale is indeed how foreign investors tended to initiate their understanding of Latin American countries, and proved to be a useful lens through which to analyze discourses of the renewable energy boom attached to multiple Latin American countries. By engaging with the region as a whole, I wasn't being forced to think of it as a fixed geography but rather a 'subject with identity, a strategic domain, an object of struggle' (Jonas, 2006: 402). Knowing that 'geographically 'bounded' case studies are not enough' (Chong and Graham, 2013: 3), I could develop an understanding of the interactions between trends at the global level and those at the local level without feeling that the field of view was too narrow. From this regional perspective I was able to work 'in' from the outside, from region, to nation state, to local. Starting from discourses about the region as a whole was helpful context to then understand the role of the state and private sector as I turned toward the national and local scales. It was also practical for the progression from desk research to fieldwork, as I could undertake research on the region and national from the UK and then turn more toward national and local once arriving in Chile. I could have started at the local level, but without a regional and national context the criteria for the local case would have been less clear.

2.2. Three interrelated scales

The use of nested case studies facilitated examining important dimensions present at each scale alongside the context of other scales and cross-scalar relationships. Nested analysis accommodates 'exploration of general relationships and explanations and the specific explanations of individual cases and groups of cases' so that questions can span both broad global processes as well as the effects of those processes in a particular location (Lieberman, 2005). An approach 'that travels through macro, meso and micro levels to build nested case-studies allows more comprehensive analysis of both external/global and internal/local factors' (Chong and Graham, 2013: 3). The nested case study aspect of the research design thus contributes to the aim of advancing multi-scalar approaches to examinations of energy transition. Along these lines, this section provides background information on the selection of the regional scale of Latin America, the national scale of Chile, and the subnational scale of the *comuna* of Renca.

2.2.1. Regional scale of Latin America

Responding to the gray literature and media coverage characterizing Latin America's renewable energy boom, I set out to focus the initial stage of research on how the Latin American region

had become a locus of global investment in renewable energy. There was considerable discussion about the growing size of solar and wind infrastructure, and the fact that ownership by local companies was being replaced by large multinationals. I examined existing conceptualizations of the political economy of energy transitions in other regions through a relational approach (Hart, 2018; Roy, 2016), identified similar or dissimilar flows and networks in the Latin American context, and explored the ways in which investors view the Latin American region as a whole.

The interpretation of Latin America as an investment frontier led me to the ways in which this potential is assessed. I was interested in applying the idea of calculative mechanisms, inspired in particular by Tania Murray Li's (2014) portrayal of a global land brokerage firm's serialization of the risks of farmland investment. A grid published by that firm attaches numerical rankings to each country. 'By setting risks out in serial form...and setting them alongside numbers, the figure suggests both authority and calculability' and 'does important work' to communicate where investors should focus their attention (Li, 2014: 598).

Similar types of calculations of risk and opportunity have been proliferating in the renewable energy arena, particularly because Latin America attracted far more foreign capital than other regions (BloombergNEF, 2018). I first reviewed representations of Latin America's investability in the form of market analyses, graphics, maps, and index rankings produced by financial services firms. Then I honed in on index rankings and the narratives attached to them. After reviewing a variety, I selected three indexes by some of the largest financial services firms: the Emerging Markets Outlook or 'Climatescope' created by Bloomberg New Energy Finance (BloombergNEF, 2019a), the Renewable Energy Country Attractiveness Index (RECAI) developed by Ernst & Young (Ernst & Young, 2019), and Deloitte's Global Renewable Energy Trends (Deloitte, 2018b). While I attempted to employ a software for textual analysis, I ended up reviewing these indexes and their methodologies in detail and then manually pulling out rationales used for country rankings and comparing them side by side.

In addition to the textual analysis of index rankings, I conducted a few interviews with representatives of investment firms and multilateral agencies, which provided additional commentary on how the regional and individual countries are assessed as investment frontiers.

2.2.2. National scale of Chile

Findings that focused on the national scale drew on data collection on tender results, interviews, participant observation, and document analysis. I conducted 41 interviews in Santiago with individuals involved in or with knowledge of Chile's and Renca's energy transition, including representatives of the *comuna*, the Energy ministry, international institutions, the private sector, and academic institutions.

After confirming a regional focus on the Latin American region, I went through a process of choosing which country should be the focus of the national scale. My initial plan was to focus on

Nicaragua, since I had worked and lived there and had studied the country's economic and political history. However, a volatile political situation emerged in Nicaragua just as I was confirming travel plans, and I was forced to reevaluate my fieldwork location. In addition to a country that was not currently under a travel advisory, my initial criteria for a new country included a location with large-scale wind or solar projects, with a challenging energy poverty or economic development problem being addressed by a local government, and availability of data and data collection. My interest in so-called ‘emerging economies’ led me to consider a different group of countries in Latin America that were further along in their pursuit of renewable energy technologies.

I became interested in how the state was engaged in energy transition in Chile, Argentina, and Uruguay, and particularly how an instrument such as the tender was deployed as an experiment or as a delivery device for financial markets. I explored whether I wanted to look at a smaller country such as Uruguay that had gone through a rapid transition from imported oil to nearly 94 percent renewable energy generation and close to universal energy access, and where a politically progressive state had considerable control over the process (Watts, 2015). Uruguay was also interesting given the perception of low risks by investors, and the question of permanency of this transition, as oil companies were still exploring for reserves (Chavez and Satoko, 2016). Another option was Argentina, where economic upheavals and particularities of the procurement process run by a state-owned company had been a stumbling block for achieving renewable energy goals (Ruggeri and Garrido, 2021). The country was behind the others on renewable energy investment, despite considerable investment in new wind farms. Of the three countries, Argentina had higher poverty rates and poor neighborhoods faced significant energy access problems (Bosi, 2017).

In the end, I opted for Chile as the most compelling option at the national scale. My initial review of Chile’s utility-scale renewable energy deployment showed that the Energy ministry was relying heavily on a tender, the primary instrument used in Latin America (Lucas and Gómez, 2017), and Chile’s tender process was lauded as very successful yet extreme in its design. Chile’s neoliberal history led it to be the first to privatize its electricity sector in the 1980s, and the country has long had a reputation as a 'safe' investment. Following a period when Chile’s government agencies wielded less control of energy planning, the Bachelet administration launched its *Energy Agenda*, dictating a vastly expanded presence at multiple scales, and declaring that ‘the State should have a more active role in the long-term strategic planning of the sector, reconciling economic, environmental and social goals toward the common good of all the Chilean people’ (Ministry of Energy, 2014: 16). This strategy empowered the state to drastically increase investment in large-scale solar, wind, and geothermal infrastructure. I was drawn to Chile’s transition from utility-scale mining to utility-scale renewable energy as a ‘techno-fix, which could supply mankind with clean energy without changing basic economic structures or social behaviour’ (Rothe, 2016: 16).

Parallel to this national scale context, what I found at subnational scale was equally compelling for choosing Chile. The Energy ministry was simultaneously investing in the empowerment of local governments, through the *Comuna Energética* program, convening diverse stakeholders at

the smallest administrative subdivision of the *comuna* to design local energy plans (Ministry of Energy, 2019). In this program, there was a clear divide between rich and poor *comunas* throughout the country, as well as widespread energy poverty in poorer regions despite nearly 100 percent grid access. Finally, I also chose Chile as a location that would provide political stability and safety for me, my co-parent, and my young children to live, although what transpired during fieldwork did not match that expectation.

2.2.3. Consideration of multiple subnational cases

For the subnational case, I was seeking a *comuna* that would provide additional insight into the state's role at a different scale, and where linkages were apparent between the national and subnational scales. Chile initiated a decentralization process in 2013 that sought to expand the capacity and finances of *comunas*; to transfer new competences of relevance to energy systems; and to improve their legitimacy, autonomy, and performance (OECD/UCLG, 2016). In alignment with this decentralization process, the call for a stronger state presence in the *Energy Agenda* strategy includes a directive for expanded SEREMIs focused on energy for each of the country's 16 regions. I was also interested in questions of territoriality, in terms of how regions designate and regulate land as the basis for financing these projects and any community-driven disputes about land use for renewable energy.

I started the selection process with a number of criteria and expectations for multiple criteria to be present in one locale. I was hoping for a case that would include the financing of a local renewable energy solution, issues of energy poverty, and involvement of the private sector. I was also expecting to focus on a *comuna* engaging with large-scale utility installations. Prior to arriving in Chile and during the first part of my time in Santiago, I planned to choose a *comuna* in another part of the country involving regular travel there. I wanted to avoid an approach that was narrowly focused on the capital, and most of the new utility-scale projects were concentrated away from the population centers, in the northern desert regions of Antofagasta, Atacama, and Coquimbo, and in the central regions of Bío Bío and Araucanía. In these regions, the state was also supporting the development of local energy strategies, or EELs (Estrategias Energéticas Locales). Thus I expected to look at a *comuna's* experience managing the influx of large infrastructure projects while developing EELs and attempting to secure finance for their implementation. One potential case I identified that included these elements was the *comuna* of Monte Patria in the Coquimbo region, where the state is engaged in both the Don Pedro Photovoltaic Park and an EEL-financed project to provide solar electricity to livestock herders.

After spending several months in Santiago interviewing and consulting with Chilean respondents, a few potential case studies rose to the top. Several cities in the southern Araucania region were widely recommended as a subnational focus and I spent several months investigating the energy poverty issues there, which were centered around air pollution, fuelwood use, and market and cultural challenges to changing technologies. The small *comuna* of Renaico had been newly minted the 'city of wind' with several wind farms approved and two under construction to replace closed coal plants, and examples of questionable corporate

engagement with communities. I was drawn to the possibility of connecting experiences at the *comuna* level in Renaico with the state's focus at the national level on contracting new projects through the tender mechanism. The other case recommendation that emerged from multiple respondents was Temuco, a large *comuna* in the Araucania region that struggled with air pollution from fuelwood but also had an ambitious plan to transition to renewable energy systems. I found Temuco interesting due to the fact that firewood was the monosource cause of pollution there (Schueftan et al., 2016), making it one of the most polluted cities in Latin America while also being the heart of the country's Indigenous community. The population relies on humid firewood for heat because kerosene and electricity are 3-5 times more expensive (Reyes et al 2018).

In parallel to these other cases, I investigated the potential of Renca, a *comuna* within the capital, as the subnational case. Renca was interesting as the site of Santiago's industrial zone and the city's power plant that had been operating since the 1960s. The Mayor of Renca was a nationally recognized figure, active nationally in questions of environmental justice and municipal economic empowerment. He spearheaded a green industrial tax that would provide reparations to the *comuna* for decades of environmental injustices from the plant, and to reforest the famous Renca hill as the country's symbolic contribution to the UNFCCC negotiations to be hosted by Chile. I was drawn to exploring the Chilean concept of *sacrifice zones*, select areas of the country that are subject to environmental injustice due to toxic industrial pollution. I was initially less interested in Renca as the connection to large renewable energy projects in other areas of the country was not clear. However, the relationship between the plant owners and the *comuna* had a rich history infused with both conflict and cooperation, including the company's financing of Renca's local energy strategy. At the time that I was seeking a municipal case study, the foundational energy project imagined in Renca, and the one which the *comuna* hoped would catapult its environmental leadership nationally, was the first industrially-linked district energy system. When political unrest emerged halfway through my fieldwork period, travel to other parts of Chile became impossible, and I decided to delve deeper into Renca as the subnational case.

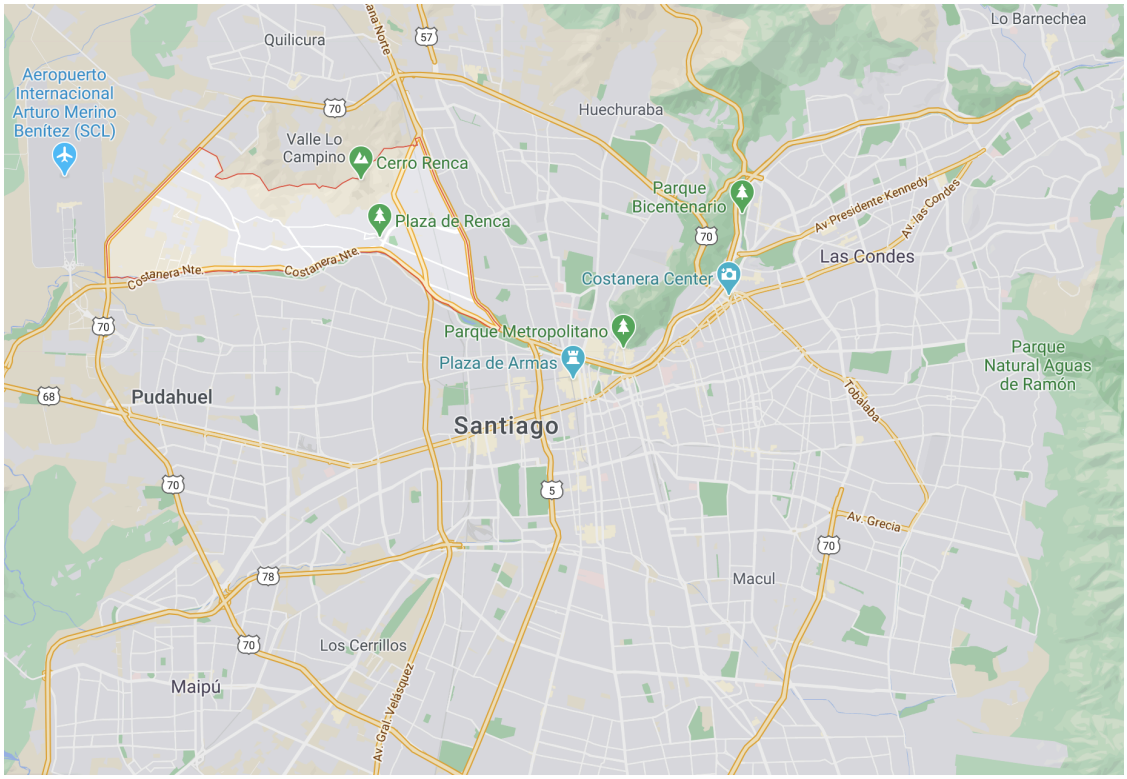
In the end I chose Renca due to its history of being turned into a sacrifice zone through concentration of industrial development, which also made it a unique site for technological and financial innovation. The *comuna* also came highly recommended by numerous interviewees. I found it to be a site where *comuna* leadership and other actors involved with the *comuna* were interested in engaging in conversations about Renca's role in the country's energy transition. The next section outlines background information about Renca that made it a compelling place to focus.

2.2.4. Subnational scale of Renca

Findings that focused on the subnational scale drew on the 41 interviews noted above, participant observation, and document review.

Renca is one of 52 comunas in the Santiago municipal region (see Figure 2.1 for location). The geographic coverage of the *comuna* spans 24 square kilometers and its projected population for 2023 was 163,102 (Biblioteca del Congreso Nacional, 2023). Prior to the Spanish conquest of the 1500s, it was the site of fertile agricultural land and inhabited by Indigenous groups such as the Xolina, Quilicura, Lampa, Quilpué, and Curacaví. Known as The Land of Renca, it was named for the Renca plant that covered the landscape (Ilustre Municipalidad de Renca, 2025). In 1867 there were only 587 inhabitants (Solano Asta-Buruaga y Cienfuegos, 1899). At the time of the creation of the *comuna* of Renca in 1891, the Indigenous peoples of Picunche had been expelled and Renca's population of 2,451 was dominated by Spanish immigrants and wealthy Creoles who owned farms providing fruits and vegetables. In 1896, there were 100 agricultural properties of great importance to the economy and food supply in Santiago. By 1930, 92 percent of the properties had been converted from rural to urban designation (Wikipedia, 2025). Annex 1 provides historical photos of Renca's agricultural past.

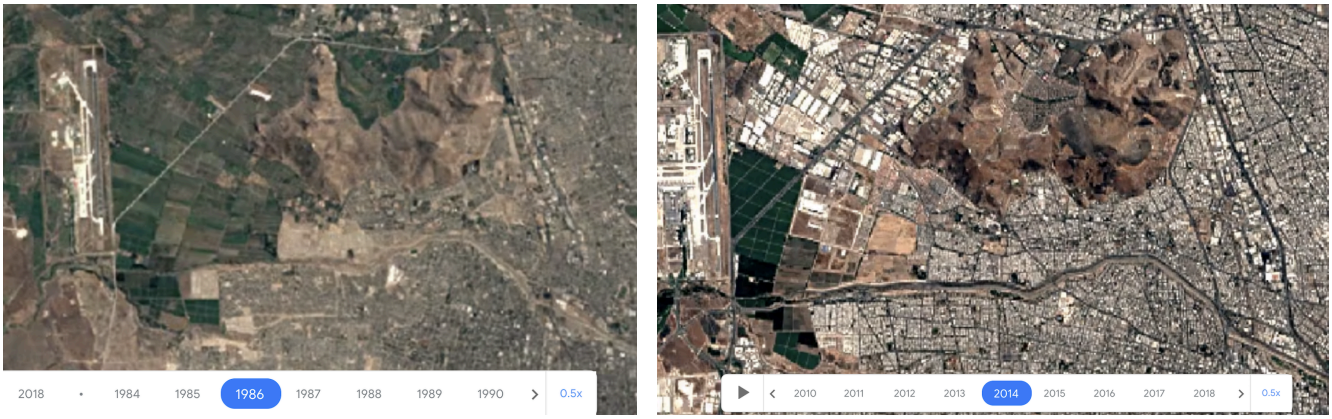
Figure 2.1: *Location of Renca within the Santiago metropolitan region*



The conversion of land from rural to urban designation continued with the transformation of Renca into Santiago's primary industrial zone. As part of a zoning initiative in Santiago in the 1930s, Renca was acknowledged as an ideal site for industry, due to its proximity to the city center, low cost of land, and access to construction materials (Fernández Castillo and Vila Muga, 2021). Urban growth in the capital led to movement of industries into the peripheral areas of the city, transforming close to 90 percent of Renca into industrial zones (Albornoz et al., 2021). During the 1991-2000 period, at least 70 percent of urban growth in Renca was for

industrial uses (Ducci and González, 2006). Figure 2.2 shows the rapid transformation of Renca's land to create the country's largest industrial zone.

Figure 2.2: Industrialization of Renca's land from 1986 through 2014.



Source: (Google Earth Engine, 2024)

In 1962, Renca became host to the capital's only power plant. The most polluting plant in the capital and in the country (El Mercurio, 2011), the air pollution it caused notoriously prevented adjacent households from hanging their laundry outside because it turned clothing black (Velásquez, 2018a). In 1998 at the same complex, a second power plant known as the New Renca plant started operation, with modernized technology but still contributing to air pollution and fueling complaints from nearby residents. The plants were sited in Renca because proximity to the center of the capital city would reduce energy losses that occur in transmission (El Mercurio, 2011).

The two plants of the Renca complex went through various transitions and ownership. The state constructed the first plant in 1962 through state company Chilectra, and in 1997 the second 'New Renca' plant started operations. In 2000, US-based company AES bought the plants via Chilean subsidiary AES Gener, and toward the end of 2017 AES Gener sold them along with two other Chilean plants to AME, a Chilean mining company, and French utility EDF. At the time of sale, those four plants made up close to 30 percent, or 750MW, of Chile's electricity supply. The original Renca plant was originally coal and then converted to diesel, and later switched to backup power, only operating 10 percent of the year. The second Nueva Renca plant has a gas turbine and a combined cycle gas and steam turbine. In the 2010s after the establishment of the country's first Environment ministry under Bachelet and growing environmental regulations around air pollution, the plant faced increasing reporting and pollution reduction requirements. See Figure 2.3 for images of Renca's power plant complex.

Figure 2.3: Renca's power plant complex

Source: (Generadora Metropolitana, 2024)

Source: author

Air pollution from the power plant complex eventually designated Renca as one of Chile's 'sacrifice zones', sites of environmental justice due to toxic industrial pollution. See Figure 2.4 for the extent of air pollution around Renca Hill. Air pollution affecting the residents of Renca and Santiago led to various proposals such as a national green industrial tax that would be

reinvested in Renca, a district energy system converting energy from the plant into electricity, among others. In advance of the climate negotiations originally scheduled for Santiago (UNFCCC COP25), the Chilean government centered their national contributions around Renca by setting a deadline for closing all of the country's coal plants by 2040. In December 2023, this promise was moved forward with the discontinuation of the original Renca plant, but leaving the New Renca plant fueled by natural gas in operation (La Tercera, 2023).

Figure 2.4: Air pollution in Santiago surrounding Renca Hill

Source: (Correa, 2024)

One of the more disadvantaged comunas of Santiago, as of 2017 about 24.5 percent of Renca's population fell within the national socio-economic survey's definition of 'multidimensional poverty' (Biblioteca del Congreso Nacional, 2023). In 2018, Renca's municipal budget per capita remained at 28 percent of the budget of one of the richest *comunas* in Santiago. The inequalities that Renca faces has been the focus of Mayor Claudio Castro who arrived in office in December 2016, and was re-elected in 2021. An engineer and former leader of a national housing organization, Mayor Castro established a substantial environmental and innovation unit in the *comuna* and spearheaded new ways of financing innovations and partnering with companies in Renca's industrial sector. He has been vocal in national politics about climate change and municipal inequalities and promoted Renca as a site for the country's pursuit of district energy infrastructure. This positioned him to serve as an unofficial spokesperson for municipal inequality during the 2019 social revolt. See Annex 2 for visuals related to Renca's experience with the national revolt.

This overview of the regional, national, and subnational scales provides important background for this research project. The next section details the process of data collection through interviews, participant observation, and document analysis.

2.3. Data collection

Data collection was primarily conducted via fieldwork in Santiago, Chile throughout the second half of 2019, and involved mixed methods including interviews, participant observation, analysis of documents, and collection of tender results. At the outset, I developed a research guide with questions organized around the regional, national, and local scales. This was used as a starting point and was updated regularly to match shifting questions throughout the fieldwork period. The national revolt erupted in October 2019 during my stay in Chile, and while I decided to remain in Chile throughout the planned fieldwork period, and I was able to secure most of the planned interviews, the protests made it more challenging and caused considerable disruption.

2.3.1. Interviews

Interviews are a means to gather a broad range of perspectives and data. Semi-structured interviews facilitate more fluid conversations that are responsive to new ideas that emerge (Hay, 2000; Valentine, 2005). Respondents were representatives of governments, businesses, and other organizations, and in a particularly critical position of 'controlling access to knowledge, information and informants'(Valentine, 2005). It was therefore essential to have in mind the respondents' institutional context in order to secure an understanding of the 'informal backstage of decision making' (Jiwani and Krawchenko, 2014: 59). Interviews are generally a valuable method of collecting information, but particularly 'in periods of great economic and social change that pose new challenges to the analytical categories and theoretical principles underlying much quantitative research,' whether related to 'the rise of new industries' or the 'retrenchment of older ones' (Schoenberger, 1991: 180). In this context of research within a specific industry in one country, the 'snowballing' method was very successful in identifying additional respondents and rounding out a broad range of perspectives (Phillips and Johnseds , 2012: 150).

The use of interviews was critical to this research as it allowed me to gather targeted information and rapidly deepen my understanding of key political and geographical issues in the country. Due to the small interconnected community of government and industry officials involved in Chile's energy sector, any citations of their commentary through interviews would be very apparent. Thus I opted to take the additional step of confirming information collected via interviews with journal articles, reports, or media articles that could be cited throughout the thesis. Interviews were conducted with 43 individuals (see Annex 1 for list) who are involved in or experts in Chile's energy transition. Although interviews informed all three scales of research (regional, national, and local), based on the informant's knowledge some interviews were exclusively focused on one scale while others necessarily encompassed more than one scale.

The intention was to gather diverse perspectives from government, industry, and non-governmental actors, thus the final mix of interviewees included individuals representing the Energy ministry working at multiple scales, multinational and domestic energy companies, industry associations, international organizations, and community organizations. The interviews were organized in batches. I emailed a group of selected informants, scheduled and conducted a batch of in-person interviews over a couple weeks, and then reviewed my notes from the interview and research guide to assess remaining information gaps and decide who to include in the next batch of interviews. Prior to each interview, I used the research guide to draw up a targeted set of research questions to cover. Interviews started from these questions but invariably led to a more open conversation based on the information I was receiving. At the end of each interview, I asked for recommendations on additional informants, documents, and data to consider, as well as additional topic areas I should consider exploring.

I found Chile to be a very welcoming environment for data collection. Almost every interview request was accepted and scheduled quickly. The national government provides a significant amount of detailed data online, partly as a requirement to its recent entry as an OECD country, and government representatives are required to respond to information requests in a timely manner. Even during the political revolt that was active October 2019 through December 2019 during my time in Chile, when hundreds of thousands of protestors were gathered outside of the Energy ministry and presidential palace, ministry representatives were willing to continue interviews. Only when the building was evacuated due to the protests turning violent were our interviews cut short, and even then the interviewee was willing to reschedule. Some of the national government representatives had never been interviewed about their work, and were enthusiastic about someone wanting to hear their stories. While some national government representatives may have been willing to participate in an interview partly due to obligation, I found that local government representatives wanted to be interviewed because they were eager to communicate their efforts, achievements, and challenges and to participate in an exchange that may bring more visibility to local governments in the context of a centralized state.

2.3.2. Participant Observation

Participant observation was critical to gaining a deeper understanding of Chile's energy transition at each scale. I attended 6 conferences and workshops of different sizes during fieldwork in Santiago, Chile and also observed the national protests. The events I observed are described below as well as compiled under Annex 3.

Participant observation allows the researcher to better understand the world as experienced by the respondents (DeLyser et al., 2009), and can enhance data quality, interpretation of data, and formulation of new research questions and directions (Musante and DeWalt, 2010). While much of the literature unpacking the methodology of participant observation focuses on embedding oneself within a local community or group of people as part of an ethnographic process, my observatory experiences involved industry and government meetings and conferences. Observation of these meetings is useful in 'examining what people do, rather than only what

they say or what they say they do' (Walsh, 2009: 77). They facilitate new information based on how people and organizations interact, and how they communicate with and about each other (Kawulich, 2005). Participation in these meetings was an opportunity to capture the language used and perspectives shared about Latin America's renewable energy boom and about Chile's energy transition, which also provided insights on the positionality of those being observed. This method necessitates negotiating access with gatekeepers as well as 'continual critical introspection on the researcher's fieldwork practices and relationships, particularly with respect to the power involved' (Walsh, 2009: 80).

Several conferences aimed at promoting investment and technological innovation helped me identify key actors as well as build an understanding of the diversity of perspectives on Chile's energy transition. The APEC (Asia-Pacific Economic Cooperation) international seminar, *Sustainable Energy for All: Learning and Challenges in Isolated Areas* (Ministerio de Energia, 2019b) featured Chile's Energy Minister and members of the Energy ministry outlining the government's goals for renewable energy investment and reaching the last mile of energy access (see Figure 2.5). This conference opened access to a series of interviews with the Energy ministry, including about their perspectives on energy access.

Figure 2.5: APEC International Seminar on sustainable energy

Photos by author

The 2019 Forum and International Fair for the Environment and Sustainability was on the topic of Circular Economy and organized by the Association of Businesses and Professionals for the Environment. It involved an industry expo demonstrating business models, innovations and ventures, and publicized business opportunities that the circular economy is expected to generate as a development strategy. At this conference I spoke with staff of energy corporations and local *comunas* to gain an initial understanding of some of the key environmental actors.

The Latin America Energy Summit (see Figure 2.6), focused on energy financing across Latin America and provided insight into narratives of risk reduction and investment challenges at the regional scale. The conference convened 150 executives of multinational and domestic energy companies, multilateral organizations, national industry associations, and the domestic banking sector from Latin American countries. To gain access, I served as a volunteer handling

registration, which facilitated speaking to each of the participants as they arrived and securing a copy of the participant list. Conference sessions focused on investment opportunities brought about by a low carbon economy, challenges with expanding electricity generation, regulation of electricity distribution, transmission and distribution roadblocks, multi-country collaboration on natural gas, and market analysis by country. Some of the presentations mirrored the message about Latin America's investment potential that I had seen in reports, while other presentations were enlightening in relation to the private sector's frustrations with Chile's tender system. This conference was particularly useful in comparing industry and government narratives. Key learnings included the significant international influence on national financing processes, the inability of Chilean banks to compete with the cheap finance offered by international banks, the inability of small and medium companies to compete with international firms, and the emergence of new financial models for infrastructure beyond project finance, and the use of Chile as a Power Purchasing Agreement testing ground before exportation of this financial model to other developing countries.

Figure 2.6: Latin American Energy Summit

Photo by author

The Solar World Congress, held in Santiago, Chile in 2019, convened over 400 participants from 48 countries (see Figure 2.7). I gained access as a volunteer. The conference focused on technological advances and applications for rapid and efficient transition to renewable energy. Sessions on financing and regulation provided useful context for researching the regional and national scales. A session on district energy feasibility in Chile led me to interviews about district energy pilot cities in Chile, and eventually to Renca as my focus case.

Figure 2.7: The Solar World Congress

The Energy Poverty Network International Seminar (see Figure 2.8) convened regional experts to investigate the realities of energy poverty in various Chilean and Latin American contexts. This conference was organized by the academic Energy Poverty Network (RedPE), a transdisciplinary collaboration platform based at Universidad de Chile convening researchers, public and private institutions, and civil society organizations. The leaders of RedPE at Universidad de Chile welcomed me into their broad research community and invited me to be an active participant in conferences and a speaker at one of their workshops. Co-sponsors included the Energy ministry as well as national and international organizations, for example the Latin American Energy Organization (OLADE). The conference explored the diverse manifestations of energy poverty in Chile and other Latin American countries in the context of territorial aspects of energy systems, climate change, SDG7 on clean energy and affordable energy, and national energy policies such as Chile's *Energía 2050*. One of the network's aims is 'collaboration for transformation,' coordinating national actors from academia, government, civil society, and the private sector, and this conference was designed as a contribution to that aim. Conference sessions included overviews of energy poverty in various Latin American countries by researchers from those countries, framing energy poverty as a dimension of climate justice, housing and thermal comfort in Chile, lessons learned and challenges in measuring energy poverty, air pollution in the context of energy transition, and development of a policy paper advocating for the Energy ministry to adopt broader definitions of energy poverty. The comparison of Chile to other Latin American countries shed considerable light on Chile's unique energy poverty profile. And in one segment of this conference, a dialogue workshop organized by the Energy ministry's *Comuna Energética* program, I participated in small group meetings that offered the opportunity to ask questions of government and academic experts to better understand local energy planning.

Figure 2.8: Energy Poverty Network International Seminar

To better understand the development of Local Energy Strategies, I attended a preparatory meeting in Puente Alto, a comuna of Santiago. The 10 participants included the environmental and energy lead for the *comuna*, leadership of various *comuna* departments, and a representative of the Energy ministry. Discussions focused on how to collect baseline data on energy use across different departments, coordinating across departments to organize this information, and identifying technological changes to explore with the utility that could be included in the comuna's energy plan. Questions arose around some departments such as the schools not yet being aware of their energy usage levels, lack of communication between different parts of the *comuna*, and lack of clarity on responsibility for electricity costs by either the *comuna* or private entities. This workshop shed light on the challenges faced by *comunas* in initiating more proactive energy planning, and demonstrated how *comunas* are prioritizing technological changes before delving into questions of equity or energy poverty.

A business roundtable workshop (see Figure 2.9) organized by the *comuna* of Renca and local NGO *Fundación Huella Local* convened corporations with industrial operations in Renca with the goal of pooling private resources to address mutual challenges faced by residents and industry. This workshop gave me access to key actors engaged in Renca's energy projects and demonstrated the way that *comunas* are navigating fiscal challenges by leveraging private resources to apply for public project funding.

Figure 2.9: Renca's business roundtable workshop

Another form of participant observation occurred by living in and traveling around Santiago during the 2019 national revolt. My experience of this event dominated my fieldwork period, and deepened my understanding of Chile's history. Indeed 'the political and temporal instability of issues in Global South contexts may result in certain issues being interpreted or told in certain ways' (Sultana, 2007: 382). On October 18, 2019, massive demonstrations began in Santiago that came to be known as the *estallido social*, or social upheaval. This term was contested as a way to minimize the scale of the event, which was in response to Chile's economic model and ended up being the country's most significant unrest since the Pinochet dictatorship. Initiated by secondary school students protesting high subway fares, cost of living, corruption, privatization, etc., hundreds of thousands of protestors gathered daily in the center of Santiago while others created barricades and vandalized or burned the city's infrastructure, resulting in 80 train stations with major damage and most downtown buildings covered with graffiti. On October 25, 2019, over 1.2 million people gathered for 'The largest march of Chile.' President Piñera responded aggressively by issuing a state of emergency and curfew and deploying the Chilean armed forces. By the end of 2019, 34 people had died and over 11,500 were injured. There was significant evidence of human rights violations including eye mutilation from rubber bullets and the central metro station being turned into a chamber for torture and sexual assault (Lamb, 2021). See Figure 2.10 for an image from the largest march, and Annex 2 for additional images documenting the national revolt.

Figure 2.10: The largest march of Chile (La marcha más grande de Chile)

Source: (Actualidad Radio, 2019). Chile's daily protests in October 2019, with flag reading 'Chile woke up' and 'We are not at war' in response to President Piñera's aggressive response to initial protests.

The protests erupted halfway through my fieldwork period in Chile and continued throughout my time there, providing a powerful backdrop demonstrating tremendous public dissent against the country's inequalities. Witnessing vandalism, infrastructure destruction, and burning train stations throughout the city on a daily basis, while monitoring the trajectory of conflict and violence between protestors and the army online, had both practical and emotional impacts. While I was careful about maintaining a safe distance from the large violent protests, what was happening in the streets directly impacted my research process. I conducted an interview at Enel's headquarters the day before the protestors set the building on fire. For interviews at the Energy ministry next to the presidential palace, I had to travel in a wide circle around the protest streets and enter through the back door to avoid the protestors, the army, and tear gas, and two of those interviews were cut short by evacuations. Interviews during this time always included a discussion of the protests outside and the ways in which inequalities were present in the country's energy system. Other practical disruptions included losing my primary form of transport due to the shutdown of the metro system and a number of interviews were canceled, postponed, or never occurred. I had been in the process of choosing a local case study, which I had expected would be in a smaller *comuna* outside the capital, but the potential travel risks during the protests forced me to choose a *comuna* I could reach by taxi inside Santiago. The protests also affected my family's experience and security in Chile. My children's schools closed for some time, we were unable to leave our apartment or neighborhood for several weeks, and closure and looting of grocery stories, pharmacies, and restaurants limited our basic supplies. I considered and explored a departure from the country once the borders reopened, but decided to stay and continue with interviews as possible.

I planned to attend the UNFCCC Conference of Parties (COP25) that was to be held in Chile at the end of 2019, and had secured a pass to attend, but due to the protests the conference was moved to Spain. I was then invited onto the Chilean delegation to the conference in Spain, but declined due to needing to catch up on in-country data collection that was delayed by the protests.

2.3.3. Document analysis

Analysis of academic and gray literature enhanced the data I was collecting from interviews and participant observation, and often focused on documentation suggested during interviews.

For the regional scale, I reviewed reports of financial services firms and articles by clean tech media outlets focused on assessing the investment potential of Chile and other Latin American countries. This process led to the identification of common narratives and arguments that framed Latin America's renewable energy boom. I collected these narratives across the documents and patterns began to emerge. Textual analysis became valuable because it facilitates 'theorising the workings of power' (Aitken, 2005: 234). Specifically, a post-structural analysis of texts views them 'as social products that are dynamic, and culturally mediated by discursive practices,' based in politics, and representing 'not only what is known, but also how it comes to be known' (Aitken, 2005: 248).

For the national scale, I reviewed a broad range of materials that included data and perspectives on Chile's tender process and related socio-environmental issues. For example, an evaluation of Chile's tender results sent to me by the Energy ministry; reports by international organizations on Chile's tender process; the Chilean government's social and environmental assessment database; a legislative database in Chile's Library of Congress, which included commentary by industry and others on energy legislation related to tenders; project documents of transnational institutions with renewable energy finance programs in Chile; press releases and annual reports of successful tender bidders and associated financing entities; and the mining industry association's proposal to establish a governmental Territorial Agency to improve interaction with communities around land use.

Also for the national scale, I collected data on the results of tender rounds. This started with information supplied by the National Energy Commission of the Energy ministry, but given some data errors in this information I had to update the numbers with publicly available data and news sources, as well as track down which projects had been sold to new owners. In some cases, data was incomplete in relation to supply over time (Gigawatt hours or GWh), which led to the presentation of data in terms of potential (Megawatts or MW) instead.

For the local scale, to better understand Chile's unique energy poverty profile and the challenges with air pollution and household dependence on firewood, I reviewed journal articles published by members of the Energy Poverty Network and gray literature on Chile's energy

poverty challenges. Examples of other gray literature include regional development plans supplied by the Regional Energy Secretariat, to better understand the subnational governance architecture; reports shared by the *comuna* of Renca, including feasibility studies for the district energy project and documentation of industry investment; reports, presentations, and local energy plans shared by the Comuna Energetica program; documentation of district energy feasibility assessments throughout the country; and documentation about the evolution of Renca's power plant and related regulation.

Following this overview of data collection methods including interviews, participant observation, and document analysis, the next section summarizes the data analysis process.

2.4. Data analysis

Data analysis was a continuous and iterative process throughout. Most of the project involved qualitative data analysis, except for the quantitative analysis of the government's annual tender process. I had planned to use NVivo, but later decided that a manual approach would work better to identify trends and concepts. The analysis of data and development of concepts was conducted in parallel, following the grounded theory method, which involves a researcher's continuous engagement with their data and comparing new data with existing findings (Bryant and Charmaz, 2007).

The process of simultaneous translation and transcription was the first opportunity for data analysis of interviews. When I came across information and concepts of note, these were annotated with detailed comments, and sometimes I coded these comments in order to note which ones seemed connected. Once the transcription into English was complete, interviews were analyzed again to identify common themes and elements as well as connections and relationships between them (Maxwell and Chmiel, 2014), which I continued to note and code through comments. Then all of the remaining themes and elements of importance were assigned codes, and organized into hierarchical categories, to facilitate an overarching review of conceptual linkages.

For the regional scale, I undertook discourse analysis as a means to understand perceptions of Latin America's renewable energy boom. This involved line-by-line analysis of index reports by investment companies that evaluated country performance in attracting renewable energy investments. After identifying and extracting key terms and narratives from each report, I collected similar terms into categories and analyzed trends and themes. Discourse analysis is the 'careful examination of talk and texts in order to trace the ways in which discourses bring into being the objects and subjects of which they speak' (Willig, 2017: 2). This is a form of coding specific to language that catalogues terms that can be used for evaluation (Potter and Wetherell, 1987). In this process the focus is not on 'truth value of what participants are telling him or her; rather, the aim of the research is to generate an understanding of what people are doing when they talk about something in a particular way' (Willig, 2017). Analyzing trends in language used at a specific point in time and in the context of certain types of texts was

valuable in interpreting what the agents of these discourses intended to achieve by deploying that particular language (Willig, 2017).

To investigate the results of tenders at the national scale, data analysis started with organizing and cleaning initial data on the results of each tender in a spreadsheet to facilitate comparison. Then for each data point I searched for documentation to verify or adjust the details provided by the Ministry of Energy. Given that projects were often sold to new owners, I also endeavored to confirm the latest project ownership and country of corporate headquarters. This verified and updated information allowed for an analysis of which countries were involved in projects based on corporate headquarters, the distribution of ownership across how many companies, and the extent to which on-selling of projects occurred.

An additional method for qualitative data analysis was the summary of key information and concepts through monthly fieldwork reports. Over the course of the fieldwork period I produced a document that listed interviews completed; summarized findings from interviews, participant observation, and document analysis; explored potential research directions; and outlined plans for the coming month. I organized reflections according to themes that were relevant to each scale, as follows:

August 2019 fieldwork report

- Establishing initial relationships in Santiago, developing interview guide and questions for each scale, and deciding on first round of interview requests
- Expansion of state role in energy planning
- Municipal capacity in the context of Comuna Energetica
- Energy justice and energy access in Chile

September 2019 fieldwork report

- Community engagement in tendering
- How private versus public electricity systems impact local energy planning
- Financing local energy planning
- Air pollution and firewood
- The energy transition discourse is narrowly focused on utility-scale renewables, and less focused on health impacts of air pollution
- Role of international agencies
- Investor perspective on financial instruments for renewable energy in Latin America

October 2019 fieldwork report

- Consideration of case study focus, including review of Renaico, small *comuna* in Araucania region; Temuco, large *comuna* in Araucania region; Renca, *comuna* within Santiago; as well as broader options of multiple local energy plans or district energy pilots
- Community generation initiative of the Energy ministry
- Energy company investment in community projects
- Balance of renewable energy supply with addressing energy poverty

- Challenges to replacing firewood
- Challenges with full electricity access
- Risks perceived by international investors, and other aspects of financing utility scale infrastructure

November 2019 fieldwork report

- History of political and fiscal centralization
- Intersection of subnational and national governance and finance around local energy projects
- Landscape of financing options available to *comuna* for energy projects
- Renca emerging as a national energy leader

2.5. Positionality and ethical considerations

Attention to one's positionality in collecting information is central to understanding 'how one is inserted in grids of power relations and how that influences methods, interpretations, and knowledge production' (Sultana, 2007: 376). Calls for reflexivity in the research process direct us to pay attention to 'personal characteristics, positionality, and the intersubjective elements in the research encounter that shape and to an extent transform the research enterprise and findings as a whole' (Adu-Ampong and Adams, 2020: 583). For this project, as I explore in what follows, my positionality emerges in the context of the South-North divide, fieldwork in which I was accompanied by my family, and elements of my background that enhanced legitimacy, including having a professional background similar to interviewees, proficiency with Spanish language, and affiliation with a local university.

Positionality is particularly important in the context of conducting fieldwork in the Global South. I was cognizant of the South-North power dynamic of being a US researcher with a UK affiliation studying Chile's energy transition, and living in Chile for only half a year. A researcher coming from the Global North to collect information in the Global South exacerbates the divide between the researcher and 'the researched' (Sidaway, 1992: 406). Collecting information in Chile, though no longer economically considered a developing country by the United Nations and OECD, is mediated by stark differences between developed and developing countries tied to the country's history and location in Latin America. Chile has experienced a long history of colonialism and Northern neoliberal philosophies that influenced the horrors of the Pinochet dictatorship and entrenched inequalities in the decades that followed. Being a researcher in this context has the potential to feed into universalist tendencies of Western academic literature characterized by 'historical and geopolitical amnesia' about imperialist legacies (Slater, 1995). In contrast, decolonial approaches necessitate 'a broader canon of thought than simply the Western canon' that employs a non-homogenous 'pluriversal' approach rather than a global 'abstract universal' (Grosfoguel, 2007: 212) and contests 'Western eurocentric modernity, global capitalism and colonialism, which are an inseparable trilogy' (Curyel Pichardo, 2014: 49).

I thus paid attention to and made methodological choices aimed at avoiding being an agent of continued extractivism, while acknowledging the limits of my ability to right the wrongs of history. Consistent evaluation of one's own motives and influences is part of a 'commitment to conducting ethical and respectful research that minimizes harm' (Sultana, 2007: 377). At the same time, individual researchers must admit the gaps in their efforts and cannot expect to directly transform these entrench power relations, as 'we cannot know everything, nor can we survey power as if we fully understand, control, or redistribute it' (Rose, 1997: 319). It is through attention to 'these dilemmas, hesitancies, insecurities and ambiguities of self identity and identity of 'others' in relation to our identity, that the role of the 'all knowing' researcher may be destabilised' (Madge, 1993: 296). In addition to the South-North power differential, I'm cognizant that my research sits within the 'symbolic economies' of academia that assign an exchange value to research and keep universities afloat (Luke, 1999: 349).

One of the primary avenues I pursued to avoid an extractivist approach was in the choice of scale. I intentionally designed this research as a multi-scalar approach that included regional, national, and local scales, rather than solely a local community-level analysis. The main purpose of this was to understand energy transitions from a macro and relational perspective in line with my interests. However, I felt this approach also prevented the entry of strained power differentials and burdens that my research might bring to marginalized populations, due to negative experiences caused by my positionality in previous professional roles in Latin America. As part of projects I was involved in with United Nations, international, and community organizations in Nicaragua, Costa Rica, and Ecuador in years past, my positionality as a white staff member from the United States working for an international organization created an automatic divide with community members. There was often deference on display in the attention I received due to the perceived hierarchical divide, and the needs of the international organizations I worked for were not always in line with the immediate needs of the community. These elements could have easily been repeated in my return to Latin America with a research project. In those roles over time I found it more appropriate for Latin American staff members who had ongoing relationships with community members to serve as the primary liaisons. I'm also cognizant of the potential burden that interviews and requests for information can put on community organizations and individual community members from marginalized populations, sometimes without the potential of compensation for their time or any benefits of the research circling back. For these reasons, I decided it would be more ethical to pursue a research project that leaned toward more equitable power relations, thus the focus on interviews with paid staff of governmental and nongovernmental organizations.

Actively parenting during fieldwork and throughout the research process had a significant impact on my research process and timeline. Being accompanied by my two young children and co-parent while in Chile influenced my positionality in both helping to embed me more deeply into Chilean daily life while also raising higher concerns about safety and restricting my time. The primary challenge of bringing along my 8-year-old and 3-year-old meant that 'care-work' was entwined with field work, which 'sullied expectations of wholly unimpeded tracts of time' (Drozdzewski and Robinson, 2015: 372). Their presence meant a doubling of labor due to responsibilities of both research and care, which ranged from securing schools to providing for

their material needs to keeping them engaged in various activities to providing emotional support. My experience throughout this research project is that being responsible for parenting alongside it demands 'high levels of corporeal and temporal discipline' (Boyer, 2010: 8). 'It is the care-time during fieldwork, and its preparation, which is the most taxing and tiring' (Drozdzewski and Robinson, 2015: 376). Beyond the time limitations, having children along amplified stress due to dropping them into new schools where they didn't speak the language; high levels of air pollution in Santiago; and quadrupling of costs and complexity for international travel, housing, and administrative complexity around the Chilean research-related visas. However, my experience was distinct from accounts of accompanied research situated in community-based spaces where children might tag along. In these accounts, researchers glean learnings from 'observing responses to our family members…in the field and reflecting on what those observations tell us about the community in question and their understandings of us' (Cupples and Kindon, 2003: 223). I purposefully kept my co-parent and children separated from my research activities, which became more important when safety became a greater concern after the national protests started.

Adding to the parental concerns above were the heightened complexities of being accompanied by my family when the unexpected national protests erupted. Our access to food, water, and medical services came into question, the borders were suddenly closed, and there was the potential of exposure to tear gas and violence during protests that passed by our apartment building and the children's schools. We opted to shield our children from exposure to the violence in the streets and in the media to ease their experience, which restricted their travel to our immediate neighborhood. During this time, traveling downtown to government buildings near the heart of the largest protests meant separating myself from my family in an uncertain and military-controlled environment. At the beginning of the protests, President Piñera announced that non-Chileans seen associating with protestors could be immediately deported, and the national guard was given the direction to fire at protestors as needed. I had originally planned to focus this research project in Nicaragua, where I had lived on multiple occasions and had a deeper knowledge of the country's history and key actors, but political instability there led me to instead take my family to a country I had never visited but was perceived as comparatively more stable.

Some aspects of my background afforded a positionality that may have opened more doors for data collection. Arriving in a very different economic and cultural environment can attach an identity to a researcher as either insider or outsider, depending on their level of familiarity. In reality the extent of a researcher's insiderness will vary along a spectrum drawing from multiple aspects of identity, and the boundaries between insider and outsider are not fixed (Merriam et al., 2001). A researcher's positionality may more accurately be understood as multi-positionality, given the manifold aspects of identity that influence their role, including how research participants construct and make assumptions about that role (Gupta-Wright, 2019). In many ways I considered myself an outsider in Chile, having never lived or worked there and only having started to research the country recently. However, I had more of an insider familiarity in terms of language and background living in and working in Latin America, experience in energy

and climate policy and familiarity with conducting interviews and research projects, as well as a Chilean academic affiliation. I explore these three aspects of positionality in more detail below.

First is my background working for international organizations. My work has often involved conducting research with and convening representatives of multilateral institutions, companies, and government agencies engaged in the energy sector. I included this profile in requests for interviews and participant observation opportunities, and did not encounter any trouble with securing interviews or having to go through gatekeepers. Conducting research with insider aspects of one's identity can deliver a 'nuanced perspective' as well as an 'equalized relationship,' an 'expediency of rapport building,' and more 'immediate legitimacy' with research subjects. At the same time, there is a risk of bias as well as insiderness leading to a difficulty in being able to step back and identify trends (Chavez, 2015: 479). This insider aspect of my positionality helped me conduct interviews on a more equal level with interviewees, not only being a student but a policy advocate and practitioner with 20 years of experience. Rather than sticking with my set list of questions, this background allowed me to more easily let the path of conversation follow the interviewees' experiences or interests, as well as facilitate an exchange of similar experiences between us, which led to deeper insights. Guiding the interviews in this way benefited from having played similar roles to my interviewees working in various areas of governance. In some cases, for example with the Energy ministry, international organizations, and *comuna*, after conducting an interview I was invited to participate in a grant proposal or serve as a panelist at upcoming events, which demonstrated that interviewees sometimes saw me as a potential collaborator rather than only a research student. On the other hand, my understanding of how policy organizations work may have influenced the kind of data I collected and my interpretation of it.

A second aspect of my positionality that helped to establish a quicker rapport with interviewees was conducting interviews and participant observation in Spanish and having a long history of living in Latin America. I am accustomed to conducting work conversations in Spanish, having worked for organizations in multiple Latin American countries. However, there were some limits to my language abilities, and this changed depending on the setting. Local dialects and terminology specific to Chile's energy industry, local actors, and governance structures were a stumbling block at the beginning of fieldwork. The ability of a researcher to lean on insider aspects of positionality 'is never a settled status but one in constant flux and negotiation' (Adu-Ampong and Adams, 2020: 519). However, I became more familiar with this localized terminology in the latter part of fieldwork and I noticed in later interviews that confirming I was familiar with these local terms enhanced the perception of my legitimacy. While interviews were conducted in Spanish I then simultaneously transcribed and translated them into English, which was one of the more labor intensive processes due to having to search online for acronyms and terms specific to Chile. I could have conducted many interviews in English given that many of my subjects were fluent, but I found the interpersonal connection that Spanish language provided was worth this extra effort.

Thirdly, my affiliation with a local respected academic institution also opened doors. I was grateful to be offered an affiliation with the Geography department of Universidad de Chile,

which facilitated the research visa and offered a potential community of researchers familiar with my discipline. Having this affiliation validated my presence in the country and my research aims, both with interviewees and those inviting me to attend conferences and workshops. Although the affiliation came with an optional shared office space and I was initially introduced to other students on my first visit, the national protests cut this opportunity short and I had to shift my attention at Universidad de Chile to the Energy Poverty Network in order to prioritize data collection amid the national political turmoil. But regardless, the affiliation on paper was a form of legitimacy that helped establish immediate rapport with new connections.

2.5.1. Limitations

Limitations of this research span both methodological and practical concerns. While I appreciated the insights offered by focusing on multiple nested scales, the level of depth at each scale was limited by time constraints. The data I received on tenders didn't always match media reports, requiring time invested in rechecking and interpreting numbers rather than turning my attention to data collection in additional relevant areas. Gathering data in Chile was limited to the fieldwork period, and options for this period were narrowed by the uncertainty and physical limitations caused by the national protests. Finally, parenting during the COVID-19 pandemic created a financial necessity of returning to work full-time and considerable delays in having to set aside the writing process for many months at a time. The lack of continuity this caused between the fieldwork stage and writing stage may have impacted the resulting write-up, and certainly was a limitation for colleagues in Chile who regularly contacted me with interest in reading and learning from my analysis.

2.6. Conclusion

This chapter outlined the methodology used to investigate energy governance and transition in Chile at multiple scales. Employing a relational scalar approach allowed me to develop a fuller picture of the Latin American region alongside the national context and the local case of Renca, and importantly the interdependencies between these scales. The fieldwork period through a range of methods provided an opportunity for 'deep learning' as well as 'critical thinking and a sense of ownership' (Hope, 2009: 170). Interviews with 43 individuals in a variety of roles, paired with participant observation and also document analysis helped me tackle my research questions from a variety of angles at these multiple scales. My positionality informed this scalar approach as well as how I went about designing the research and collecting data.

3. Unfinished Business: Spectacle and Safety in Latin America's Renewable Energy Boom

Looking toward the regional scale, this chapter demonstrates the importance of keeping the role of global financial actors in view when examining energy transition at any scale. The chapter explores the project's first research question, *How do financial actors create investment directions in the Global South?* As context, the global transition to renewable energy is now attracting injections of tremendous amounts of capital in infrastructure as large-scale solar and wind plants come to be constructed globally. Up until 2019, Latin American renewable energy plants had attracted the largest share of global financing among emerging markets (BloombergNEF, 2019b). While bringing new finance to the region, Latin America's renewable energy boom has reenergized long-established pathways of international financial flows and serves as a continuation of the region's entrenched process of financialization, a 'technology of power' (Bracking, 2012: 274) that has concentrated investment among a small group of private transnational financial institutions. The growing influence of the global financial sector is of critical concern because it impacts the trajectory of energy transition (Bridge et al., 2019; Mazzucato and Semieniuk, 2018) and the extent to which various actors at multiple scales throughout the region will determine their own energy future. The chapter thus examines the ways in which financial actors assert influence across scales.

While this chapter draws on the fact that financial actors create investment directions as described in component 2 of the conceptual framework, the focus in this chapter is on *how* they go about securing those directions through discourse and calculative devices as outlined in component 3 of the conceptual framework. The chapter advances an understanding of the discourses and devices employed by financial actors in the renewable energy arena by accounting for how these align with a new investment wave toward Latin American countries. It also demonstrates how calculation and commensuration contribute to the directions of this investment wave via the devices used by financial actors to favor certain investable locations over others.

Section 3.1 examines the discourses that have been deployed to sustain Latin America's renewable energy boom. It finds that a dual discourse of spectacle and safety has emerged to allure investors while also attempting to put the ghosts of past investments to rest. Section 3.2 turns to the devices which were central to instrumentalizing this dual message: renewable energy investment indexes. These calculative devices constructed by professional services firms serve to direct their powerful corporate clients toward locations deemed less risky and thus more investable. These indexes are critical representations of the efforts of financial actors to affirm the investability of select geographies of the Global South. Bringing these threads together, Section 3.3 of the chapter aims to shed light on the discursive power of the financial sector and the crucial role it plays in opening up new investment frontiers both sectorally and geographically.

3.1. A dual discourse of spectacle and safety

> He had a strange sense of being haunted, a feeling that the shades of his imagination were stepping out into the real world, that destiny was acquiring the slow, fatal logic of a dream. 'Now I know what a ghost is,' he thought. 'Unfinished business, that's what.'
>
> *-Salman Rushdie, The Satanic Verses*

To tackle Latin America's unfinished business—its infamous trajectory of past foreign investment and dependency that opened the veins of a continent (Galeano, 1997)—I argue that financial actors constructed a dual discourse of spectacle and safety around the possibilities that renewable energy holds. On one hand, the discourse makes the investment potential *spectacular* in order to attract attention and entice investors, using language that excites and makes the possibilities irresistible. And in a complementary way, the discourse also makes the investment potential safe, by allaying the fears of investors betting on new technology in environments where politics and economics are viewed as less than ideal for investment. This part of the discourse seeks to neutralize the risks and tame investors' worries that the specters of past investments will reappear.

Thus the spectacle and specter of investment coincide, both rooted in the latin *spectare*, to see or behold. Investment potential is first turned into a performance that is dramatic and visually striking, facilitating a 'management of attention' (Crary, 2001: 74). As Tsing (2000: 118) explains, the 'possibility of economic performance must be conjured like a spirit to draw an audience of potential investors. The more spectacular the conjuring, the more possible an investment frenzy.' While spectacle is what you see, or rather what you are shown, specter is what you don't see or don't want to see. The inability to fully see or know provokes fear and danger. Specters, ghosts, and apparitions are imaginary forms that are understood as visiting from the past with the purpose of rectifying a wrong that is unknown to the person being visited. A common metaphor in Latin America's magical realism literary tradition is the ghost that returns to haunt the living in order to redress unfinished business, including 'victims of the harsh reality of dependence and underdevelopment' (Erickson, 2009). Putting these particular ghosts to rest is a critical first step in opening new investment channels, as the specters must first be dealt with and the assurance of safety established.

3.1.1. The dawn of a renewable energy boom

In 2013, at a moment when investment across Latin America's renewable energy sector was gaining tremendous momentum, the Global Green Growth Forum organized their first meeting in Latin America, *Rethinking Our Energy Future* (Vergara et al., 2013). It was a unique occurrence for all of the influential regional actors to be together in one room: the major development banks, Inter-American Development Bank (IDB) and Latin American Development Bank, as well as a Japanese bank; executives of major energy corporations, Enel Green Power, Siemens, Solarpack, and Vestas; heads of energy ministries from the region's leading clean energy

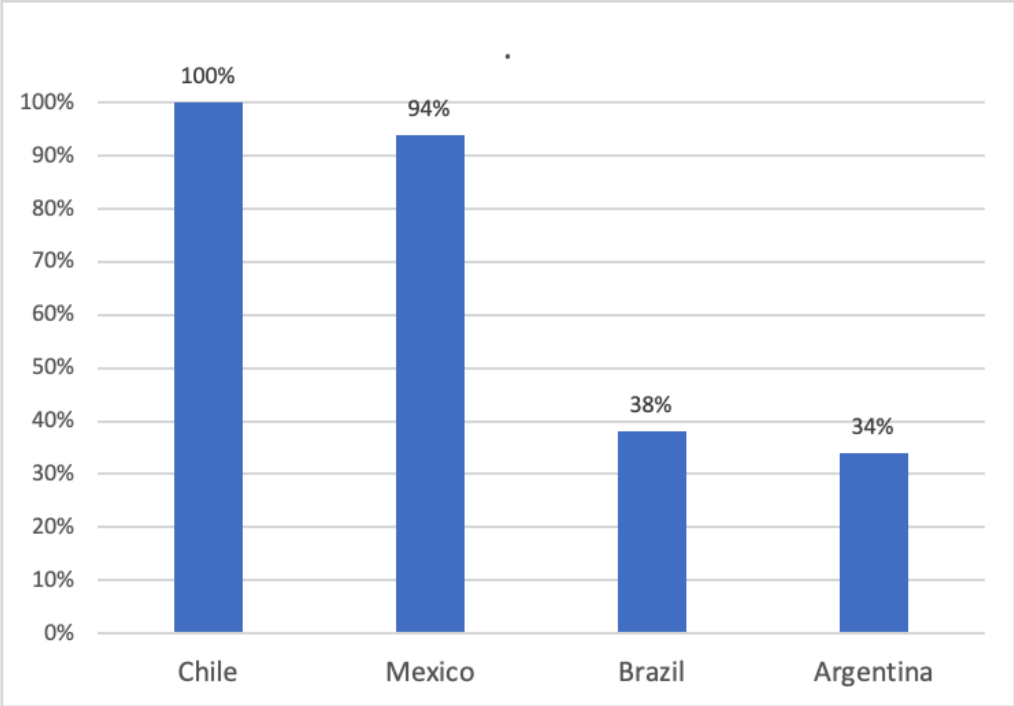
markets, and political leadership from Denmark, Germany and the United States; heads of UN agencies working on climate and energy (UNFCCC, UNEP, and IPCC); and heads of the leading international energy organizations International Renewable Energy Association (IRENA), International Energy Agency (IEA), and Latin American Energy Organization (OLADE) (IDB, 2013a). Marking the dawn of the region's renewable energy boom, the gathering intended to build momentum for attracting a new wave of investment to the region, indeed a 'rethinking' of how the region's energy resources could be organized and who would be involved.

The idea was to sell Latin America as a place of tremendous potential. An image projected at the meeting and featured on co-organizer IDB's press release framed the discussions with a rhetorical question: 'Do you know where we could obtain all the electricity we need?' The answer, of course, was right here in Latin America. The organizers hammered in that the region's 'renewable energy endowment is large enough to cover its projected 2050 electricity needs 22 times over' (IDB, 2013b)**.** Many of the presentations chimed in with similar evidence that the prospects were high for Latin America's rapid transition to renewable energy. IDB referred to the allure of 'first-mover advantage in one of the world's fastest growing economic sectors (Vergara et al., 2013: 6). The head of the UNFCCC welcomed the energetic atmosphere, likening it to a political campaign for renewable energy where 'the only things missing were the banners, the crowds, the chants, and the flags' (Figueres, 2013: 1). It was a revving up and a rallying of troops to shape Latin America as a sound landing place for the global renewable energy industry.

This was the year that the global renewable energy industry started to take Latin America seriously (Krulewitz, 2013b). The Economist identified 'regional' energy markets such as Latin America as ripe for a new era of private capital investment (Economist Intelligence Unit, 2013: 3) and shortly afterward, mergers and acquisitions in the region's renewable energy sector almost doubled in the course of a year (The Wharton School, 2016). Before the boom there were at most four large solar farms in the region with a total capacity of merely 114 megawatts, and no country in the region had a market or regulatory reforms to attract foreign capital for large-scale renewable energy infrastructure. But by the middle of 2013 investors had financed the construction of almost 100 times that capacity, or 9.8 gigawatts (Krulewitz, 2013b; Power, Finance & Risk, 2019).

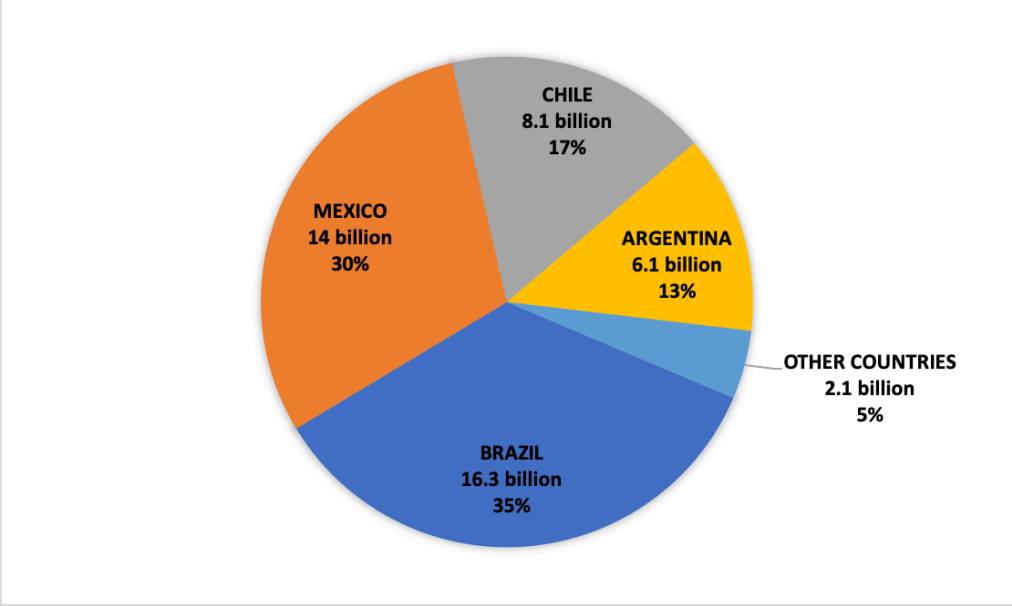
Although grand in scope, the nature of investment in Latin America's energy transition has been increasingly narrow, a signal of the financialization of the region's infrastructure. While smaller companies and domestic project developers were the ones to jumpstart solar and wind markets in the region, alongside Brazil's early and more protectionist market, by 2018 there was 'no more room for the little guys in Latin America's clean energy market' (Dezem and Chediak, 2018). Finance for Latin America's energy transition is now increasingly private capital from outside the region (BloombergNEF, 2019b) (see Figure 3.1) that is highly concentrated among fewer and larger institutional actors (BloombergNEF, 2019b), largely European energy companies, utilities, and financial institutions. Capital for Latin America's renewable energy sector has also narrowed in its destination, with 95 percent going to the building of plants in just four countries: Brazil, Mexico, Chile, and Argentina (BloombergNEF, 2020) (see Figure 3.2).

Figure 3.1: Renewable energy plants owned by foreign companies and their subsidiaries after select tenders[1]



Source of data: (IDB, 2019)

Figure 3.2: Distribution of clean energy investment in Latin America 2017-2019[2]



Source of data: (BloombergNEF, 2020)

[1] The specific tenders selected by IDB for this analysis are Brazil's 22nd New Energy Tender; Chile's Tender 2015/02; Mexico's 1st Long-Term Power Tender; Argentina's RenovAr 1

[2] This data includes investment in new-build large-scale projects and small distributed capacity

3.1.2. The making of a Latin American spectacle

Spectacle has been central to the heavy selling of Latin America as a renewable energy investment frontier, because it is a necessity for propelling investors into action (Tsing, 2000). Through a dramatization of potential, financial actors seek to 'shape the global landscape of investability' (Le Billon and Sommerville, 2017: 216). In clean tech and business media, the region's renewable energy investment potential was described as 'almost limitless' (Marczak and Engelke, 2016: 41), 'set to explode' (Hill, 2013), 'heating up' (Munsell, 2017), 'untapped' (Flato, 2017), and could see 'exponential' (Lacey, 2019) and 'massive' (IRENA, 2020) growth. An energy industry magazine called it 'an understatement to say South America's wind development market is hot' (Vestas, 2012: 1). As outlined in this section, spectacle in Latin America's renewable energy boom involves how big the projects can be, how abundant the resources are, how fast the market is growing, and ultimately how much money can be made.

Discourse relating to investment is dominated by the size of projects because it communicates that renewable energy is a real player, both in terms of financial opportunity and service delivery. It also establishes renewable energy as a contender with fossil fuels, allowing for comparison on familiar terms, and challenging the widely held assumption that renewable energy projects would never arrive at a size that could generate enough electricity to serve the needs of the electricity grid. While the vast majority of renewable projects are less than 40 megawatts in size (IDB, 2019), the infrastructural footprint of some solar and wind projects has grown tremendously in just a couple years (see Table 3.1). By 2018, the Villanueva solar photovoltaic project in Mexico was the world's largest outside India and China and was projected to have an installed capacity of 754 megawatts with 2.3 million solar panels covering over 9 square miles (Gonzalez, 2018) (see Figure 3.3). Companies that build these mammoth plants often declare their arrival with mini-documentaries that show off the sprawling rows of solar panels, complete with triumphant military-style music. The fascination with ever-larger scale, a race to arrive at the highest number of megawatts, has turned into a competition of 'bragawatts' (Merchant, 2020) (Krulewitz, 2013a). Plants 'built for wow factor' (Merchant, 2020) have 'generated a lot of hype for various Latin American markets' even before the largest plants were a reality (Krulewitz, 2013b). This bigger-is-better mentality is reminiscent of an infamous competition between two wealthy Chilean men to build the region's tallest skyscraper, for the purposes of being known as the individual who brought a great symbol of wealth and power to the country (Rojas, 2009).

Table 3.1: Latin America's largest solar and wind plants as of 2019, including existing or projected installed capacity

Plant name	*Country*	*Size*	*Owner/Financier*
Villanueva	Mexico	754 megawatts (solar PV)	Enel Group
Lagoa do Ventos	Brazil	716 megawatts (wind)	Enel Group
Sao Goncalo	Brazil	608 megawatts (solar)	Enel Group
Horizonte	Chile	607 megawatts (wind)	Colbun
Condor	Chile	571 megawatts (solar)	Mainstream Renewable Power
Cauchari	Argentina	500 megawatts (solar)	Import-Export Bank of China

Sources: Mexico (Gonzalez, 2018); Brazil wind (Enel Green Power, 2019); Brazil solar (Frangoul, 2020) Chile wind (Azzopardi, 2020); Chile solar (Molina, 2020); Argentina (Garrison, 2019)

Figure 3.3: One of the world's largest solar photovoltaic plants, in Mexico

Source: (Enel Green Power, 2018)

In addition to the grand scale of individual plants, spectacle in this context also summons a sense of abundance, the idea that resources and space are plentiful. As Latin America's renewable energy potential was explained in the early days of the boom, 'all the way from the border of Mexico to the tip of Tierra del Fuego and the Caribbean islands, there is a lot of sun to be harvested' (Krulewitz, 2013a). Long before the boom, an executive of a Spanish renewable energy corporation compared the region's energy model to mono-crop agriculture (Ruiz, 2006), offering an infinite supply of sun and wind resources. A discourse of abundance and 'optimistic expectations' shifts the conversation away from scarcity, often to advance particular sectors or political goals, or to specifically pump up the value of shares (Teschner and Paavola, 2013). The

availability of energy resources can be ‘woven into discourses and debates about national identity, international relations, a nation's path of future development, and its significance on the global arena’ (Bouzarovski and Bassin, 2011: 783). As a point of comparison, this is the opposite of the oil industry’s challenge of ‘how to organise scarcity in the face of prodigious abundance’ (Bridge and Wood, 2010: 565) that drives advantageous pricing. Yet these old and new technologies share the reality that ‘the conditions that determine relative power and financial performance are not those of geology alone’ but rather how the industry is organized around questions of ownership, capacity, and politics (Bridge and Wood, 2010: 575).

The speed of growth adds to the spectacle. Throughout 2013 there were very few power purchase agreements signed in Latin America, but as of 2014 cleantech media announced a ‘massive’ change that had occurred. The Latin American solar market was ‘growing faster than any other regional market in history,’ twice as fast as Europe’s boom, ‘which pales in comparison’ (James, 2014), and a rapid 20 percent compounded annual growth rate was predicted for the booming wind market (Trabish, 2013). The extraordinary growth potential was transmitted through hard numbers: in the course of 12 months, more than a gigawatt was under construction, contracted capacity increased by nearly 600 percent, and the number of projects increased by 84 percent. By 2017, Latin America made the list of ‘Solar’s Next Gigawatt-scale markets,’ as Brazil was predicted to become the first country in the region to develop 1 gigawatt every year (Munsell, 2017). The region’s clean energy market grew more than 25 times faster than the global rate, and it became clear that ‘big developers are willing to fight for their share at whatever cost’ (Bloomberg News Editors, 2019). The pace of growth is particularly tempting to aggressive investors because fast appreciation is critical in speculative investment. As one investment advisor noted, ‘Money can be made if you time the roller coaster ride well’ (St. James, 2019).

The amount of money to be made is also a dazzling prospect for investors. The primary reason for the region’s surge in investment is often explained as the decreasing cost of building plants with renewable energy technologies as compared to fossil fuel sources, including the availability of cheap land and lower bids through government tenders. Citigroup declared that ‘the importance of Latin America having similar prices for conventional and renewable energy cannot be overestimated’ (Romano, 2014: 14). Likewise, an investment magazine in the UK announced, ‘the most important factor boosting Latin American renewable energy actually has nothing to do with the region.’ Instead the main driver comes from outside the region: global advances in renewable energy technologies that have made prices more competitive than traditional energy sources (Latam Investor, 2017). Many years before costs came down, renewable energy corporations seeking to expand investments in Latin America understood price stability as the primary advantage of renewables but bemoaned the high initial investment costs of developing plants that made them uncompetitive with conventional technologies (Ruiz, 2006). But then a ‘mini gold rush’ (Vestas, 2012: 5) emerged. The potential profits to be made from renewable energy became a ‘tantalising prospect of a dawning major market’ with ‘great resource on cheap desert land’ that ‘investors in the US and further afield would really love to get their hands on’ (Carus, 2013).

As convincing as these narratives of abundance, speed, and profit are, Latin America's renewable energy boom wasn't only created by dazzling investors with possibilities. Investors are haunted by the debacles that came before them, and thus the spectacle of Latin America's investment potential must be paired with a dual message of safety, to satisfy investors' worries about taking the leap. The following section introduces the idea that in order to lure investors to the region's renewable energy sector, the ghosts of past investments in Latin America must be put to rest.

3.1.3. Ghosts of investments past

Investors considering Latin American countries as a place to build a large solar or wind plant weigh the possibility of returns on investment against the knowledge of risks that have befallen other investors in the past. The hard sell of the attractiveness of Latin America's renewable energy market has a deliberate purpose of dispelling skepticism. Responding to a cleantech media article on the arrival of large solar projects in Latin America, a commenter diminished the possibility of change in light of a deep history of exploitation in the region's electricity generation system.

> 'Given the fact that Spanish-owned utility companies dominate...with mostly monopolistic market presence and rates that can be called extortion...there's little room for serious adoption [of] on-grid solar power in Latin America. Until we throw out the conquistadores again!' (Krulewitz, 2013b)

The legacy of foreign conquerors evoked here points to the gaping wounds left by a parade of investment over centuries, ushering in ever deepening dependency to foreign actors. This is a history that has been 'engaging communities in a continual battle against natural resource exploitation and the forces of global capital, resulting in repeated and widespread clashes, violence, repression and human rights abuses' (Raftopoulos, 2017: 388). In the Late Victorian imperial era, world financial powers struggled 'for the privilege of extending their trade into politically unprotected markets' (Silver and Arrighi, 2003: 332). The growing export economy in Latin America at the turn of the 19th century attracted capital from Europe and the United States, ceding regional industries to foreign control, under a classic liberal era of economic ideology.

This liberalization campaign circled back during Latin America's financial crisis in the late 1970s and 1980s where massive foreign debt to the World Bank, IMF and commercial banks ushered in the so-called lost decades. To access loans, Latin American countries were forced to (re)liberalize trade and foreign investment and to impose 'a large dose of austerity' (Block and Somers, 2014: 18) that drastically reduced social programs and deepened inequality. This process 'further reduced the political autonomy of borrowing countries' (Goldman, 2005: 52) and 'democratic outcomes were trumped by the inexorable demands of the global financial institutions' (Block and Somers, 2014: 18). By the 1980s and 1990s, 'economic liberalism came back with a vengeance' (Silver and Arrighi, 2003: 326) and 'under the neoliberal logic of

privatization, even the most essential public-sector services…were put on the auction block' (Goldman, 2007: 787). During this crisis period, Latin America's electricity sector was largely privatized, facilitating the entry of private investors in the sector and turning state-owned utilities into companies that handled generation and distribution of electricity (Balza et al., 2013). Following the global financial crisis of 2008-2009, post-neoliberal governments emerged in Latin America to push against this wave of privatization and to nationalize energy industries.

As a response to crises for investors, this long history of (re)liberalization persists in the era of 'green neoliberalism' (Goldman 2005). Beginning in 1989, states seeking to access development finance have been required to restructure their regulatory frameworks on electricity, land, natural resources, and taxes and capital flows (Goldman, 2005), in a process intended to produce places as new investment sites, now often under the umbrella of climate change (Bigger and Webber, 2020). From the Late Victorian era, to the debt crisis of the lost decades, to present day, various forms of structural adjustment have been imposed in Latin America to cushion investors from perceived risks. While an array of financial structures have been created to protect investors (Goldman, 2005), the possibility of investing directly in infrastructure represents a break from this and in some ways a return to the initial appearance of foreign infrastructure investment in the Late Victorian era, coinciding with a growing involvement of global investors in infrastructure (O'Neill, 2009; Torrance, 2008).

Given the weight of this history, the discourse around Latin America's renewable energy boom cannot be a full-throttle endorsement, but rather warns investors when the risks are too high. Clean tech media is one place where work is carried out to validate and assuage fears around the specter of foreign investment. Alongside declarations of a boom, often comes a warning about barriers to navigate, such as unstable politics and ineffective policies (Trabish, 2013), which can 'spook' investors (Garrison, 2019). An adviser addressing foreign investors suggested that they 'have to know how to manage volatility if you want to do well in this part of the world' (Ramirez, 2018: 14). The region's largest clean energy markets are the subject of full headlines delivering cautionary tales: 'Mexico mired in uncertainty' (Jones, 2019), 'Argentina's clean energy future is at risk under new leadership' (Gilbert, 2020), 'After Violent Clashes of 2019, Investors Reassess Chile's Prospects for Renewable Energy' (Deign, 2020), and 'Renewables reluctantly line up for Brazil's 'bloodbath' tender' (Spatuzza, 2019). Investment experts describe the region as 'a pretty crazy place to do business' given that 'political and economic volatility can make markets super-hot one year, and then nonexistent the next' (Lacey, 2019). The market is at once exciting, unpredictable, and chaotic due to aggressive tender mechanisms that cause unsustainable 'hypergrowth.' The largest clean energy market, Brazil, is known to investors as state-controlled with a complicated tax structure and requirements to engage the local economy, 'which no one in industry wants' (Lacey, 2019). A discussion of the 'tantalising' prospect of Mexico's burgeoning market also 'cautioned half-hearted solar developers hopeful of striking Mexican gold,' suggesting that they bring their own professionals to this uncertain frontier because 'there is nobody here that knows solar, there is nobody here that knows wind' (Carus, 2013).

3.1.4. The promise of safety

Establishing investability in Latin America requires mollifying investor fears around the perceived risks of new forms of financial speculation. This need for investors to secure safety is not new, having emerged around infrastructure investments of the Victorian era. This second part of the discourse communicates that adequate returns are worth the risks, and it is safe enough to warrant an investor moving into the unknown. As discussed below, elements of making the possibility 'real' include establishing the existence of the resource potential and capacity, the absence of state intervention, the characterization of these states as easier than investing in industrialized states, and the construction of the 'emerging markets' label.

The first element of this safety narrative establishes that the gold exists. Heat maps showing the locations of solar and wind resources help to establish safety by assuring investors that the resources are significant and where they can be secured. In 2006, when most Latin American countries had outdated solar and wind maps, one of the themes of a renewable energy policy forum in the region was the importance of credible resource information. Confirming the areas of high potential for solar and wind locations was described as 'a quantification parameter of the resource' that was an important prerequisite for generation companies, banks, and financial institutions to secure loans and evaluate investment risks (Rivera, 2006: 4). In parallel, financial media announced the region's 'world-beating renewable energy potential' (Latam Investor, 2017) that is 'almost limitless' (Marczak and Engelke, 2016: 41). The Inter-American Development Bank signalled that investors taking advantage of the region's new resource potential would have an advantage in one of the world's fastest growing markets (Vergara et al., 2013). And the opportunity is vast because 'renewables, such as wind, solar and geothermal, have barely made a dent in Latin America's energy landscape' (Latam Investor, 2017).

A second element of this narrative of safety is the absence of state interference and thus the ability of capital to move freely. Despite the central role that the state generally plays in investing in renewable energy innovation (Block and Keller, 2015; Mazzucato, 2015b), investors often herald Latin America's unique lack of subsidies and incentives on renewable energy. This message could be driven by a variety of factors, from neoliberal anti-state sentiment to exhaustion with the volatility of state mechanisms to procure renewable energy, such as tender processes in Latin America or US renewable energy tax credits. In 2013, cleantech media indicated that the biggest question in the global solar industry was 'How, and when, will the solar market progress beyond incentives' and projected a transition to a 'post-subsidy reality' (Kann, 2013). A few years later in 2016, a shift emerged in the headlines when fixed government prices via feed-in-tariffs were being replaced by competitive tenders for the lowest price. 'You put solar on that stage where it's not dependent on a single government incentive program, not dependent on subsidies of any kind, and all of a sudden, the market potential of solar jumps an order of magnitude' (Wesoff, 2016). This narrative centers minimal state involvement because investors perceive that route as easier for securing capital, as explained during a clean energy panel at a Latin American business conference:

> ‘If you’re underwriting a project and you have a lot of ‘government gimmes,’ that sends private equity investors away. So what’s nice about Latin America is in many cases you’ve got a privatized market-driven price without a lot of ‘government gimmes’ which makes it a lot easier to underwrite.’ (Bailey, 2018)

The idea put forward here is that projects are easier to finance when they are more independent from state involvement. Investors express different concerns about state involvement depending on the Latin American country in question. The uncertainties range from fluctuating prices that governments set for purchasing power generation, to requirements for local hiring, to lengthy state assessment systems for social and environmental impacts. Latin American countries were bellwethers for the unsubsidized and market-centric approach. Cleantech media in 2014 suggested that investors ‘forget Japan, China and the U.S.’ and instead pay attention to Latin America where ‘we’re seeing renewable markets evolve with far less government largesse’ (Wesoff, 2014). While incentives in other regions were driving solar booms, unsubsidized markets in Chile and Mexico were also starting to attract big developers (Lacey, 2014).

A third element of the safety narrative is the idea that Latin American countries offer uncrowded frontier markets that are easier and less costly to navigate, compared to industrialized and other markets that are perceived as more complex and saturated. Obstacles to financing projects in European and US markets are often trotted out as a driver for moving investment to other places. Major corporations active in renewable energy projects in the US and China ‘seek geographic diversification as near-term projects grow dubious in those countries’ (Vestas, 2012: 1). The move to Latin America is acknowledged as part of a boom-bust cycle plaguing the solar industry. The solar industry is described as ‘lucky’ because ‘every time one of these markets starts to crash, another market is on the upswing‘ (Wesoff, 2016). A maturing wind market and the end of tax credits in the US were held up as a driver of Latin America’s wind boom (Trabish, 2013), and solar market crashes in Spain, Italy, Germany, the UK, and the Czech Republic preceded booms happening elsewhere (Wesoff, 2016). Part of the narrative is about capital market saturation. As Citigroup contends, ‘In mature markets in Europe, for example, the optimum locations for wind turbines and solar farms that are close to centres of energy demand are often already occupied. In contrast, the Latin American market is far less developed and the best sites remain available’ (Romano, 2014: 15). In addition to a lack of subsidies and incentives reducing engagement with the state, Latin American markets are considered easier in that there are limited or no requirements for developers to include ‘local content’ in their project proposals (Flato, 2017). Comparatively in South Africa, the state has required that renewable energy generation projects be jointly owned by South African institutions and include a minimum proportion of black ownership and community shareholding (Baker, 2015).

The fourth way that global financial actors signal a safe location for investment is through the reconceptualization of developing countries as *emerging markets*. Rather than simply existing in parallel to a market in an industrialized country, the emerging market is a location that is more visible to investors, having passed a threshold of financial potential. Investors designate countries as ‘emerging’ because only in the 1990s did portfolio equity investment in developing

countries become commonplace (Sidaway and Pryke, 2000: 187). Three decades later, the BRICS (Brazil, Russia, India, China, and South Africa) have persisted as the major emerging markets, as suggested in ongoing investors narratives such as the Bloomberg headline, 'Emerging Market Investors Think The BRICS Are Back' (Bartenstein and Oyamada, 2017). Nevertheless, the epithet has since expanded to many more developing economies. Such categorizations of developing countries are labels that 'help boost a country's attractiveness to foreign trade and investment by anticipating their future potential in hyperbolic language' (Mohan, 2015: 2). The term evokes 'avowedly novel locations' and 'discourses of exploration, exoticism, unpredictability and wildness.' Rather than simply replacing the term 'developing countries,' financial actors engage in 'elaborate processes of comparison, alterity, marginalization, and opposition to other categories.' These particular markets 'require a shared imagination to be produced amongst participants' prior to channeling investment flows, through which the 'complex and messy 'reality' of places and social relations are being obscured by highly selective projections (Sidaway and Pryke, 2000: 189).

As outlined above, a dual discourse centered around concepts of spectacle and safety has been circulated in relation to Latin America's renewable energy sector. To open new investment channels, this discourse is also institutionalized and packaged in the form of renewable energy investment indexes, which is the focus of the next section.

3.2. The role of devices in the discourse of spectacle and safety

As noted in component 3 of the conceptual framework, calculative devices are a means through which the materialization of a discourse such as the one delineated in the section above is achieved. Calculative devices facilitate 'making things the same' (MacKenzie, 2009: 451), creating abstractions that are separate from political realities (Langley, 2008; MacKenzie, 2009), and removing uncertainties that would be problematic for markets (Callon, 1998a). They are a means by which certain factors are on visual display while other factors are disguised (Castán Broto and Baker, 2018; Li, 2014; McCarthy and Thatcher, 2019). This section explores how calculative devices, specifically renewable energy investment indexes, carry the discourse that opportunities are spectacular and that investing is safe, in service of constructing a Latin American renewable energy boom.

Like other calculative devices, renewable energy investment indexes are deliberately constructed and highly subjective. A composite index presents large amounts of data in a standardized frame, just as a composite image is the result of combining multiple images into a single one. With their end users in mind, firms decide which datasets to include and exclude, and then assign a weight to each indicator or group of indicators. This delivers a ranking of countries along a scale, in which countries that meet the firm's most favored conditions receive a higher score and those with the least favored conditions fall at the tail end. The process of weighting gives the index-maker considerable power to determine which factors should be emphasized, minimized, or excluded. At any point in this process, both indicators and entire countries can be maintained within the scope of calculation or removed based on a variety of

subjective factors. Firms then take the final index results and determine how to visualize them, another point in which they can highlight certain aspects of calculative results over others. Thus, index building is not a science but instead a deliberate tool to back up a particular message, a composite of a *chosen* set of factors.

In the context of decision making that is increasingly data-driven, indexes and similar vehicles of investment advice are intended to steer investors to places that carry the lowest risk. Utilizing the discourse of spectacle and safety that helps alleviate dilemmas about opportunity and risk, indexes are devices that help investors make decisions about the geographical direction of investment flows. This section examines these dynamics in three prominent renewable energy investment indexes constructed by the professional services firms Bloomberg, Ernst & Young, and Deloitte (See Table 3.2). As outlined in subsections below, the findings are that these indexes value liberalized countries, promote one-size-fits-all infrastructure and finance, and reinforce the power of highly influential firms that construct the indexes.

Table 3.2: Renewable energy investment indexes included in this analysis

Index name	***Company***	***Description***
Climatescope - The Emerging Markets Outlook 2019	Bloomberg New Energy Finance	"Climatescope is an online market assessment tool, report and index that evaluates individual markets' readiness to put energy transition investment to work. A deep dive into how surveyed markets are driving the energy transition, it provides snapshots of current clean energy policy and finance conditions that can lead to future capital deployment and project development." (BloombergNEF, 2024)
Renewable Energy Country Attractiveness Index 2019 (RECAI)	Ernst & Young	"Since 2003, the biannual Renewable Energy Country Attractiveness Index (RECAI) has ranked the world's top 40 markets on the attractiveness of their renewable energy investment and deployment opportunities. The rankings reflect our assessments of market attractiveness and global market trends." (Ernst & Young, 2022)
Global Renewable Energy Trends 2018	Deloitte	"...outlines the key global renewable energy trends that will transform the renewable energy landscape—and help companies seize opportunities, adapt to new circumstances, anticipate future changes, and identify new business opportunities." (Deloitte, 2018a)

3.2.1. Valuing liberalized countries, and disciplining the rest

Renewable energy investment indexes prioritize a liberalized investment climate by ranking countries favorably only when they adopt this model. Landing at the top of these indexes creates a dramatic effect where ‘winning’ countries are exalted and celebrated. The Emerging Markets Outlook or ‘Climatescope’ created by Bloomberg New Energy Finance (see Figure 3.4) indicates that a country with ‘strong policies and a more liberalized power sector tends to be more welcoming to private investment than one with weaker frameworks and less liberalization’ (BloombergNEF, 2019b: 51). Similarly, the Renewable Energy Country Attractiveness Index (RECAI) developed by Ernst & Young (see Figure 3.5) rates 40 countries on how attractive they are for renewable energy investment and deployment, described as whether ‘the macro stability and investment climate enable or impede the ease of doing business in a country’ (Ernst & Young, 2019). The assessment criteria delineated by Deloitte’s 2018 Global Renewable Energy Trends is whether 10GW has been installed and the extent of the country’s capacity for solar and wind development relative to others, resulting in a map (see Figure 3.6) highlighting the top markets for wind and solar investment (Deloitte, 2018a). While there may be differences in which countries each index favors depending on the criteria used, they share a common purpose of circulating the investability and potential of a select few countries, and excluding other countries along with numerous other factors of renewable energy development.

Figure 3.4: Countries ranked as top emerging markets for clean energy investment, by BloombergNEF

Figure 71: Climatescope score of top 15 countries

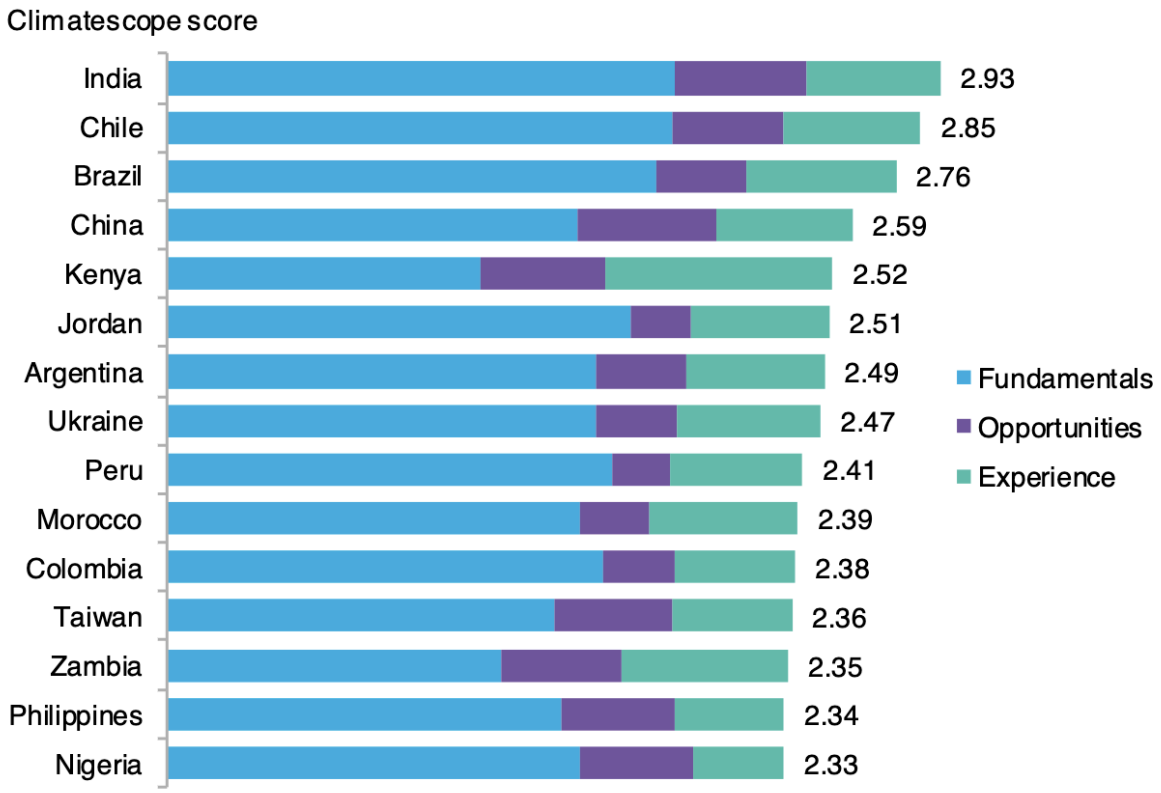
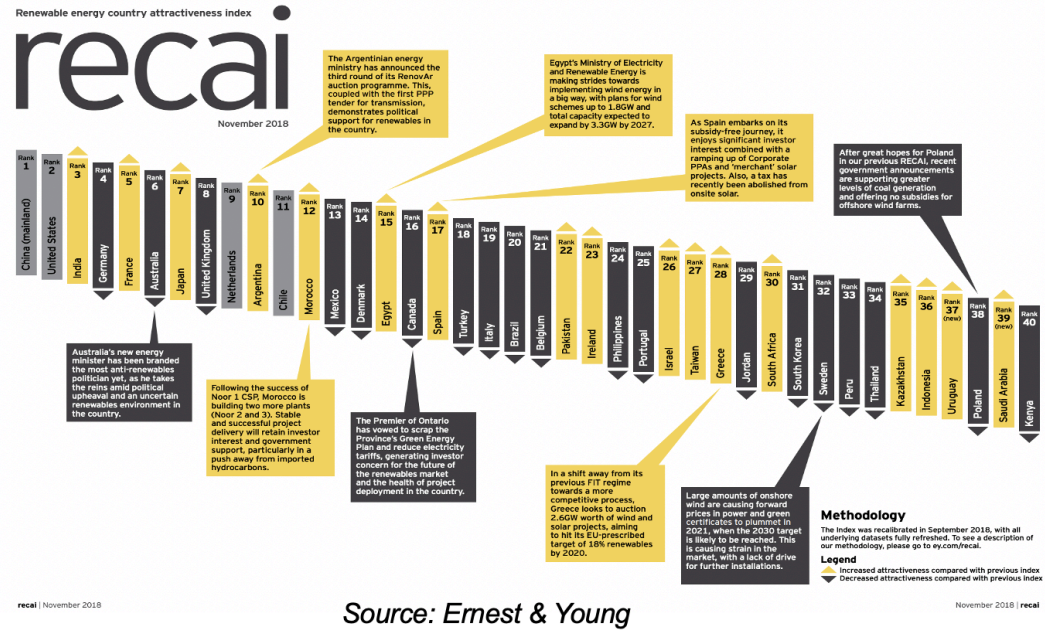
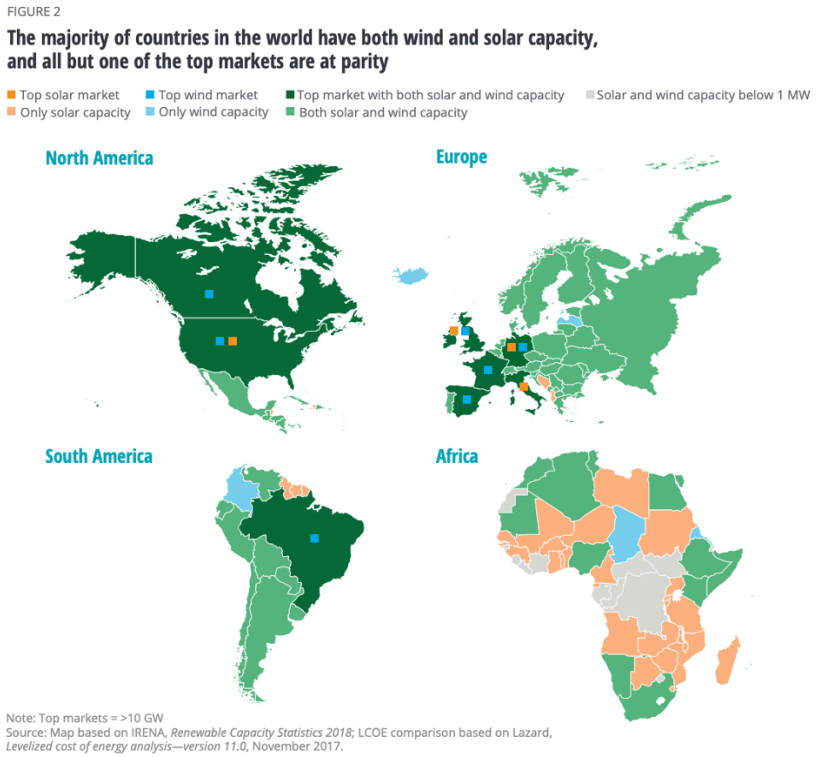


Figure 3.5: Countries ranked by investment attractiveness, by Ernst & Young



Source: Ernest & Young

Figure 3.6: Countries designated as top markets, by Deloitte



For countries relegated to the bottom of an index, or excluded entirely, these devices have the effect of disciplining governments that fail to perform (Okoth 2015). Naming countries that should be avoided serves the purpose of comparison, assigning more value and safety to countries at the top. In Climatescope's interactive online database, users can choose between a map of the top ten global countries and a map of the bottom ten countries. Figure 3.7 shows Latin American countries ranked by cross-border clean energy investment, a stark example of financing concentrated in the region's more developed countries (BloombergNEF, 2019a). In the overall regional ranking in the 2019 Climatescope, Latin American countries listed at the bottom include Paraguay's energy market that has no private companies invested; Bolivia's nationalized energy sector; and Ecuador's transmission system run by a state-owned utility. These countries were also excluded entirely from the map of resource potential published by the Inter-American Development Bank (see Figure 3.8).

Figure 3.7: Latin American countries ranked by cross-border clean energy investment, by BloombergNEF

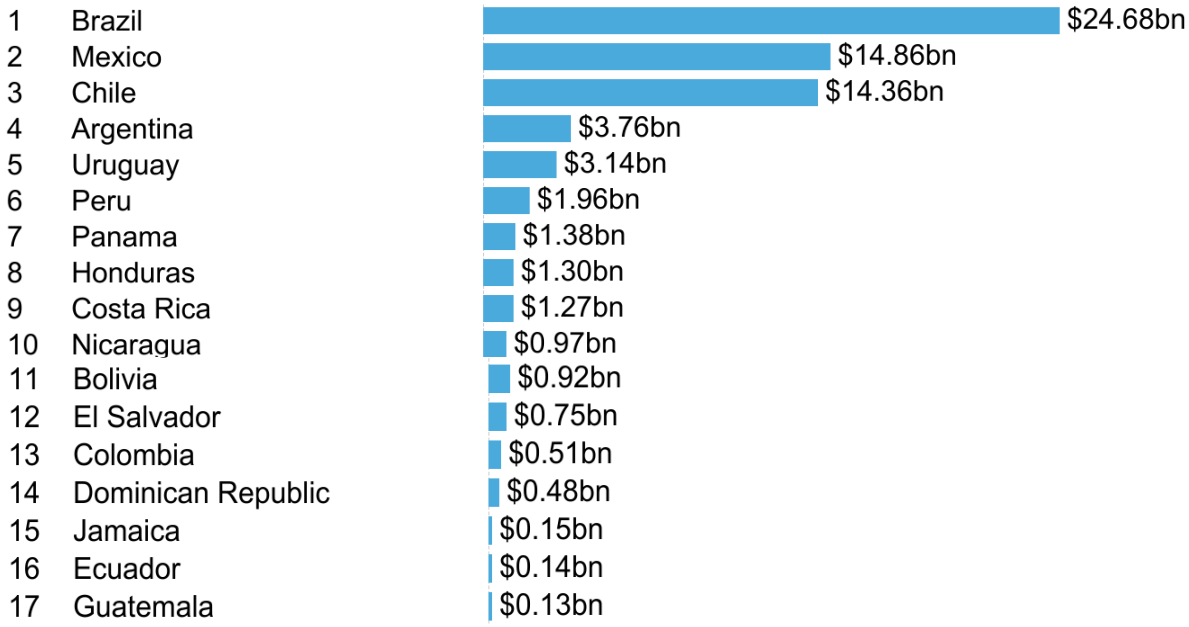
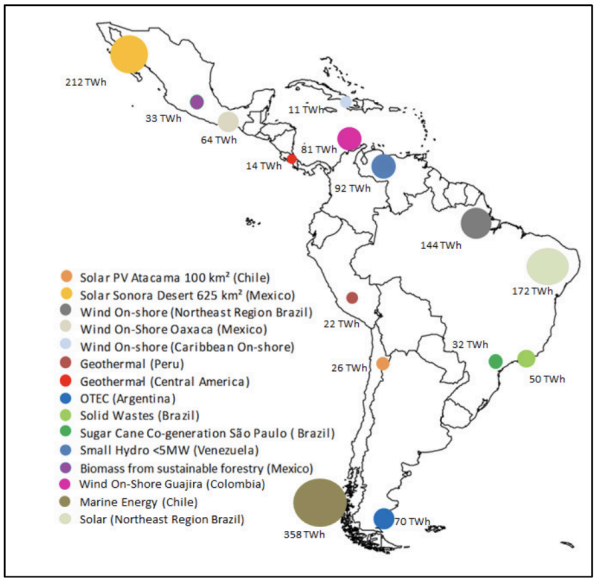


Figure 3.8: Renewable energy resource map sanctioning some Latin American countries while excluding others, by Inter-American Development Bank

Figure 5. Examples of specific RE-rich sites for electricity generation



Estimated Site Specific Technical Potential: Mexico (Solar) [26]; Wind On-shore (Brazil)[27]; Venezuela[28]; Argentina[29]; Mexico (Wind On-Shore)[30]; Brazil (Solid Wastes) [31]; Brazil (Sugar Cane Co-generation) [32]; Chile (Solar PV) [33]; Peru [34]; Central America [35]; Mexico (Biomass) [36]; Caribbean [37]; Colombia [38]; Chile (Marine)[39] , and Brazil (Solar).[40]

Source: (Vergara et al., 2013)

While countries ranked at the top are further along in the process of financialization, countries that fall at the lower end of the ranking are holding onto more state control. Climatescope favors unbundled markets, or when generation, transmission, and distribution of energy is controlled by different entities, a structure favoring private finance over central state control. The 2019 Climatescope index removed a previously used indicator on local clean energy manufacturing, a move that could conceivably favor cheap imports and disadvantage countries that seek to build more local ownership and provide jobs (BloombergNEF, 2019b). As another BloombergNEF report explains, a country categorized as having a weak enabling environment, less or no clean energy policies, and a more monopolized energy market 'presents more barriers to private investors and provision of concessional finance would hardly help crowding-in commercial investment. Because of the weak enabling environment these countries also present a low to zero experience in wind and solar' (BloombergNEF, 2019c: 105).

3.2.2. Promoting one-size-fits-all infrastructure and finance

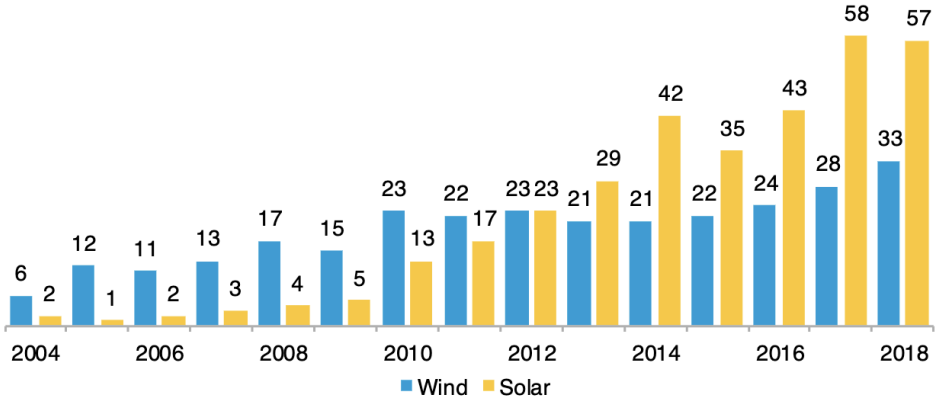
While these indexes compare the investment environments of different countries, the projects to deliver generation are assumed to be homogenous, helping to deliver a more uniform comparison that helps to facilitate the discourse of spectacle and safety. The uniformity serves to veil the considerable heterogeneity of renewable energy projects and entities financing them

(Mazzucato and Semieniuk, 2018; Ouma et al., 2018). The options for building solar and wind energy infrastructure are diverse in a multitude of ways, including the scale of a project, who will build and own it, how it is financed, how land is secured, and which end users it serves or does not serve. Ignoring this diversity, indexes portray each country as a container in which to drop a large solar or wind plant. As such, they neglect to consider what a country might need and obscure the numerous questions that go into determining the parameters of energy transition in a particular place and time. Moreover, when countries are the sole subject of comparison, it paints a picture that the nature of the investment itself is irrelevant in determining the success of renewable energy projects.

These indexes make a spectacle of large-scale infrastructure, a scale that is also safer and familiar to incumbent energy actors. The Deloitte and RECAI indexes herald the moment that solar and wind plants had gone 'mainstream' (Deloitte, 2018a: 20; Ernst & Young, 2018b) and 'truly industrial in scale' (Ernst & Young, 2019). Climatescope emphasizes that economies of scale are critical to cutting the up-front capital costs of equipment that solar and wind plants require. A single utility-scale plant is celebrated as having the potential to transform an entire country's financial flows for renewable energy generation for the year (see Figure 3.9) (BloombergNEF, 2019b). One of the drivers of the large-scale narrative is that projects at this scale allow fossil fuel corporations to switch out one technology for another and 'make the sort of returns they want to make, and are comparable to their current asset base' (Ernst & Young, 2018a: 7). The narrow emphasis on large-scale infrastructure reduces the visibility of smaller-scale and decentralized solutions. Climatescope focuses on utility-scale plants that are over 1.5 megawatts, and the financing mechanisms that support that scale. Latin American countries that sit at the top of the 2019 Climatescope ranking, Chile and Brazil, are chosen based on the highest spending on generation and capacity, and the index registers no data for these countries under the indicators measuring investment in smaller off-grid infrastructure (BloombergNEF, 2019a).

Figure 3.9: Emphasis on utility-scale infrastructure in BloombergNEF's Climatescope

Figure 36: Number of emerging markets securing at least one utility-scale solar/wind clean energy financing in a calendar year, 2004-2018



Source: BloombergNEF. Note: Utility-scale projects are typically larger than 1.5MW. Includes 101 non-OECD nations, plus Chile, Mexico and Turkey.

Another common narrative across these indexes is that only major corporations are relevant players, as they can access the sizable pools of capital necessary to finance large renewable energy plants. The safety narrative here is that a path has already been established and major investors will be in good company among their peers. While utility-scale projects are seen as 'bankable,' Climatescope argues that smaller projects have trouble securing finance because debt instruments don't allow for scaling to larger project sizes (BloombergNEF, 2018: 13), a reality that has allowed major European energy companies to increasingly outbid smaller solar and wind companies based in Latin America. Deloitte's index argues that only large corporations have access to the kinds of power purchase agreements that facilitate the delivery of electricity from plants of this scale (Deloitte, 2018a). And RECAI reports that the considerable complexity and financial engineering required to secure financial support for large projects (Ernst & Young, 2019) is insurmountable for smaller companies, and thus the range of actors involved in proposing solar and wind plants has narrowed as the magnitude of project size grows. These indexes also emphasize that capital should not be sourced from domestic banks, because lowering the cost of developing renewable energy plants in emerging markets 'has historically been hampered by higher priced domestic capital' (BloombergNEF, 2019b: 8; Deloitte, 2018b). The emphasis on foreign capital contributes to a locus of ownership far from the location of renewable energy infrastructure, and that this infrastructure is more and more embedded in a process of financialization.

3.2.3. Reinforcing the power of professional services firms and investors

Professional services firms that construct these indexes rely on the perception that their knowledge, data, and investment advice are safe to follow. Through the sanctioning of certain narratives over others, indexes establish professional services firms, and by extension the corporate clients that engage their services, as the rightful decision makers of how the transition to renewable energy systems is financed. Firms that create renewable energy investment indexes are powerful industry influencers. They manage tens of billions of dollars in revenue, hold significant proprietary information about the energy sector, and command tremendous attention from the industries they serve. Indexes reaffirm the legitimacy and authority of these firms and their ability to engage in 'creative manipulation' as the producers and mediators of knowledge (Doloreux et al.eds , 2010: 258). In their own descriptions of what they deliver, professional service firms evoke ideas of spectacle and safety in articulating how they help their clients navigate new investment frontiers and changing investment realities while building trust and confidence. EY 'exists to build a better working world, helping to create long-term value for clients, people and society and build trust in the capital markets' (Ernst & Young, 2022). Deloitte 'helps clients anticipate the changing landscape and take advantage of emerging opportunities by bringing 'an approach to executable strategy that combines deep industry knowledge, rigorous analysis, and insight to enable confident action' (Deloitte, 2018a: 1). And BloombergNEF helps 'commodity trading, corporate strategy, finance and policy professionals navigate change and generate opportunities' (BloombergNEF, 2024). Like other calculative systems, indexes crafted and propelled by these firms confirm the 'legitimacy, authority and power of financiers' (Bracking, 2012: 281) by creating 'regimes of truth and legibility around the relative investability of particular countries, sectors, and projects' (Le Billon and Sommerville, 2017: 216).

Perhaps the most powerful work of these firms, through the construction and dissemination of indexes, is their ability to portray safety by making other aspects of renewable energy development invisible. Countries are presented and judged in these indexes as a singular and simplistic entity. The performance of each national market is visualized through a single score and ranking, or through a color shade on a map, excluding a myriad of social, political, economic, and spatial factors. Yet energy regimes involve multiple actors working across a dispersed state and across different scales (Bulkeley and Schroeder, 2012; Power et al., 2016). The many conflicts that arise around siting solar plants and wind farms are hidden, as are which actors are financing and owning infrastructure. The focus is also on grid-connected electricity generation, and not what happens after the electricity is generated, such as the material impacts of large-scale infrastructure as well as transmission and distribution. The energy needs of the population, including questions of energy poverty, accessibility, affordability, quality of supply, and disparities between different populations, are not assessed as part of a country's performance. Chile, for example, was ranked by Climatescope as the highest performing country globally in 2018, yet has 9 out of the 10 most polluted cities in South America due to the high cost of electricity that drives reliance on firewood in colder parts of the country (Quiroz and Today, 2019). These factors and others are excluded because they don't fit the discourse of spectacle and safety that will usher in a financialized pathway for Latin America's energy transition.

3.3. The discursive power of financial actors in the Latin American region

This chapter explored the project's first research question, how financial actors create investment directions in the Global South. In the context of Latin America's renewable energy boom, financial actors circulated a dual discourse of spectacle and safety to create a rush toward the region's solar and wind resources while also providing assurances to investors by minimizing the ghosts of past investments. This dual discourse was circulated through renewable energy investment indexes, which were found to value liberalized countries, promote one-size-fits-all infrastructure and finance, and reinforce the power of highly influential firms that construct the indexes.

This account of how financial directions are initiated by global actors, as framed in component 2 of the conceptual framework, demonstrates the importance of examining market-making and energy transitions across scales. Without this multiscalar framing of the influence of global financial actors, market-making processes at national and local scales could incorrectly be interpreted as deriving solely from the interests of national or local actors. Instead, market-making processes in the Global South should be examined in the context of financial actors seeking to remove barriers to the circulation of capital. While there are notable explorations of renewable energy investment booms (Furnaro, 2019; Knuth, 2018; Power et al., 2016) and the neoliberalisation of renewable energy (Harris and McCarthy, 2020; Siamanta, 2019; Spivey, 2020), the aim here is to understand how particular regions become the targets for new gold rushes, and how the investment surge in Latin America came about.

The influence of financial actors across scales was found in this thesis to be achieved through the construction of a dual discourse of spectacle and safety. This discourse helps maintain the conditionalities that investors attach to finance, deepening historical patterns of dependency and maintaining the usual direction of finance toward liberalized markets. Solar and wind energy are converted into tradable assets, in a process that reproduces forms of capital that quickly become divorced from the massive plants they finance. In the context of Latin America's history, dramatic performances about resource abundance and potential profit must be paired with assurances of safety. Interrogating what is behind this discourse and these devices contributes to an understanding of 'who controls energy and for what purpose' (Huber and McCarthy, 2017: 666), how power relations lead to particular energy pathways (Power et al., 2016), and who benefits or loses out (McCarthy and Thatcher, 2019). And paying attention to the role of these incumbent forces in the energy sector and global economy helps to interrogate whether a transition is perpetuating the status quo or bringing about true transformation (Newell, 2018).

This chapter also advanced an understanding of how financial actors materialize these discourses through the novel example of the renewable energy investment index, framed by how financing is shaped by discursive power (Bridge et al., 2019) and the role of calculative devices (Callon, 1998a; MacKenzie, 2009) as detailed in component 3 of the conceptual framework. These indexes are deliberately constructed to put this discourse to work in more concrete and institutional form, by calculating and ranking the investability of countries. They are a tool for investors to dictate the direction of financial flows, and in the case of energy systems to anoint the particular forms of finance and infrastructure that are deemed worthy of attention. This narrow focus allows financial actors to remove blockages to capital circulation (McCarthy, 2015) in certain directions, impacting the financing prospects of less liberalized countries and the potential to address energy poverty and other aspects of energy systems that are made invisible. This novel account of a calculative device further reveals the power of the financial sector to determine the trajectory of Latin America's energy transition, affirming the value of both a multiscalar and relational approach to understand energy market-making.

While financing is critical to Latin America's energy transition, the empirical findings surfaced here confirm that the boom reinvigorated long-established processes of dependency and financialization, as well as the concentration of investment among a small number of private transnational financial institutions. While there are slight differences in the scope and design of the three prominent indexes studied here, as a whole they all channel attention in a unified direction, to the exclusion of numerous other important aspects of renewable energy development that don't fit in with the narrative. Countries are ranked as investable when they follow a liberalized investment model, and indexes assume that generation infrastructure and many other aspects of country contexts are homogenous. Value is attached to large-scale infrastructure, and only major corporations are seen as relevant players. This device was also found to reinforce the power of professional services firms. By documenting how uninvestable aspects of renewable energy development are excluded from calculation, this account furthers scholarship on the power of global financial actors to influence energy transition at multiple scales.

In the context of these directions created by global financial actors and to further demonstrate the value of a multiscalar lens, the next chapter shifts to the national scale, interrogating the second research question on the role of the national state in making energy markets and attracting investment. The state operates in the context of this dual discourse of spectacle and safety, as well as efforts to materialize this discourse to create investment directions toward certain countries and not others. This positioning is interrogated through an investigation of Chile's tender system, a device designed to reduce energy systems to a standardized framing that fulfills the investment preferences of multinational companies. Chile employs the most streamlined version of the tender, demonstrating the power of this device to facilitate governance through the market and move energy transition in a very specific direction.

4. No strings attached: The reductive tendencies of the renewable energy tender

Building on the previous chapter's exploration of financial actors creating investment directions in the Global South, this chapter shifts focus to the national scale, exploring the second research question, *What is the role of the central state in making energy markets and attracting investment?* In the context of the thesis' advancement of a multi-scalar approach to understanding energy transitions, the first component of the conceptual framework focused on political economy is salient for demonstrating how the central state is influential across scales. The chapter examines the structural power and agency of the central state in energy procurement, the reality of its dispersed and assembled nature, as well as its close alignment with global financial actors. The third component of the conceptual framework focused on cultural economy approaches is also essential here, as the state's alignment with global interests comes in the form of a device used to convert energy systems into a form that global financial actors would deem more investable.

The chapter first turns to examine the role of the central state in creating markets (Section 4.1), propelling financialization through using the device of the tender[3] to commodify energy systems. Tenders have become a prolific device in the development of energy markets and transition to renewable energy systems. While tenders were only used globally by 6 countries in 2005 for this purpose, by 2017 more than 65 countries were using tenders (IRENA, 2017), and they are responsible for the majority of investment in renewable energy generation throughout Latin America (BloombergNEF, 2020).

To investigate the Chilean tender system, Section 4.2 examines its component parts: (i) sealed bids delivered in performative events; (ii) an algorithm that sorts winners and losers; and (iii) contracts that bind the state and investors together for the long-term. The thesis argues that the essence of the tender is to reduce energy systems to a standardized framing that fulfills the investment preferences of multinational companies. It delivers investment with 'no strings attached' to the on-the-ground realities of energy systems. No amount of tweaking the design can escape this logic, such that the continued reliance on tenders to build renewable electricity generation will deliver energy systems that follow the same model.

This is followed by Section 4.3 that begins by outlining how the tender device developed over time in Chile. The section then analyzes the results of tenders during the 2015-2020 period, finding that non-Chilean companies have been awarded most of the country's electricity generation, contracts have been concentrated with a small number of multinationals, and on-selling is rampant, all of which pushes the country toward further financialization and centralization. In conclusion (Section 4.4), the Chapter returns to the question of the role of the

[3] While the terms tenders and auctions are often used interchangeably (Gephard et al., 2017) (Baker, 2021), this thesis uses 'tender' to refer to the broader procurement process, as the narrower 'auction' portion of the process is limited to the time between opening the bidding and selecting the winner.

central state as evidenced by the market-creating essence of the tender, as well as implications for Chile's energy transition and global use of the tender for procurement.

4.1. The state's role in creating markets and commodifying energy systems

While the state's role in a country's energy sector is often understood as limited to regulation and planning, a range of scholarship demonstrates the ways in which states play a more profound role. Mazzucato (2015a) shows that the state actively creates and shapes markets through innovation investments, taking the first steps that allow private actors to follow. Johnstone and Newell (2018: 75) challenge divisions drawn between the state and market and call for more attention to the relational, 'processual and dynamic nature of the state in configuring geometries of power between different actors.' Baker (2021: 5) points to the limits of a 'nationally bounded focus in an increasingly financialised and globally interdependent world.' Bulkeley and Schroeder (2012) advocate for an understanding of the state that centers dispersed practices and ensembles, while Langley (2018: 173) points to state actions that are 'at once strategic and diagrammed and experimental and assembled.'

As this section will demonstrate in practical terms, the state often works to maintain existing financial models and plays a central role in financialization of energy systems. In examinations of procurement processes in other countries, the role of the state has been to privilege existing modes of investment and established systems that allow incumbent actors to maintain an advantage (Baker, 2015; Baker et al., 2014). The state often works in lockstep with investors toward mutually beneficial aims (Newell and Phillips, 2016). Chile's energy sector is a prime example of one in which the returns have become more important than the energy produced (O'Neill, 2009, 2013) and financial channels are a central element of profit (Krippner, 2011).

To channel investment into energy systems, states employ the tender as a device that can deliver a standardization and abstraction required by investors. The tender is a calculative mechanism that, as described in the introduction chapter, constructs a framing that selects elements to be included or not (Callon and Muniesa, 2005). Assessing bids and selecting winners requires representing electricity generation projects in a way that makes them comparable. Projects must be disentangled (Callon, 1998a) from their setting and rearticulated as a bid employing a uniform metric. Through this device, multifarious assessments involved in the development of an energy generation project are made the same (MacKenzie, 2009) and into comparable form by assigning a price per megawatt hour (MWh), equal to 1,000 kilowatts of electricity generated per hour. The tender does not assess the power plant itself, but the price in relation to how many MWhs can be produced.

The diversity of elements that can be calculated into or excluded from these abstractions is immense. Bids reflect a wide variety of companies, locations, plant sizes, and technologies, and each company calculates multiple elements into one number. This can include everything from construction to more indirect costs of electricity generation, such as land costs, materials, equipment, labor, transportation, fuel, temporary construction site buildings, housing, financing, taxes, government fees, legal fees, insurance, risk allowance, a country's financial profile,

research and development, etc. Many important elements of energy systems are left outside the bounds of the tender's calculation, including the socio-economic and historical context of electricity generation sites, processes of land acquisition, construction plans, which entities are involved, which have been consulted, etc. Projects may be deeply embedded in space, but they are chosen without any attention to how they interact with the space, aided by calculative processes that are incapable of commodifying those more ambiguous factors (Lansing, 2012).

Drawing on this understanding of the state's dynamic role in market-making, the next section delves into three objects that propel the tender, providing a window into the inherent nature of this device.

4.2. The objects of Chile's market-making tender

In the Chilean tender process, three objects work to reduce the country's energy system to a standardized framing that fulfills the preferences of multinational investors, while binding the state and investors together over a prolonged period of time. These objects, as outlined in this section, are sealed hard-copy bids delivered in performative events, an algorithm delivered through specialized software, and long-term contracts.

4.2.1. Sealed bids delivered in performative events

The most visible objects critical to performing the tender are sealed bids submitted by generation companies. These bids represent the range of values that companies assign to ownership of a portion of Chile's electricity generation. Envelopes with bids are sealed to demonstrate that companies, which share in the risk of overbidding, are not aware of one another's bidding price, encouraging the lowest bids possible.

But the envelopes themselves cannot attain legitimacy without the public bidding event in which they are featured and performed. Rather than having bidders submit their proposals digitally, the hard-copy sealed proposals are opened ceremoniously at Chile's 'National and International Public Bidding' event. As Smith (1989) notes, the distinguishing characteristic of auctions is that they are public, visible, and governed by strict rules, thus imparting legitimacy to the process and to whoever wins. They offer a 'way of generating rules and practices for resolving… uncertainties and ambiguities…in a manner acceptable to all participants'. Who the participants are, whether bidders or observers, is unique to the auction, and critical to establishing legitimacy. An auction and its legitimacy is 'governed by collective decisions that are highly sensitive to the various social positions of the participants' (Smith, 1993).

The performative events where bids are ceremoniously opened help to deliver the certainty that investors require. Bidding events can be understood as a 'judgment device' sending a strong signal that appears to guarantee quality and attach legitimacy to prices (Kharchenkova and Velthuis, 2018: 460). Bids are unsealed in public view in order to 'sustain the performance of

competition' (Ghosh, 2018: 20). Callon (1998b) described how economic framing as akin to theater performance in that material elements of that performance give the audience cues about what to expect. In the context of tenders, delivering what is expected and ensuring that everything goes according to plan is what attracts investors. This requires pushing aside anything that may bring uncertainty, as the performance 'derives its power from its relation to that which it cannot be' (Lansing, 2012: 207). This economic performance to achieve an investment frenzy is what Tsing (2000) terms a conjuring.

Opening sealed bids in the presence of representatives of industry and government during a 'public adjudication' process also serves the purpose of narrowing the field of contenders. Following Lansing (2012), the object of exchange, the hard-copy bids, are co-produced with the field of exchange, the public adjudication event. Requiring the electricity supply offer to be witnessed in public is one way that Chile's National Energy Commission (CNE) encourages what they consider 'serious' offers from larger companies, while deterring unpredictable offers from smaller ones, which they see as a necessity in a small and new market like Chile.

Chile's public bidding events are carefully choreographed and performed to frame expectations about the tender process. The 2022 event, for example, was facilitated by a representative of Enel, the distributor administering the tender on behalf of the CNE. Enel's representative opened the event by welcoming representatives of CNE and the Enel team, and explaining this was an event required by national regulations to determine electricity supply for regulated customers starting in 2027 for 15 years. He then indicated the event represented a transparent process, one that was open to observation by the public and streaming online. In previous years, representatives of CNE, Energy ministry, industry associations, and other government authorities were in attendance to give speeches and witness each supply company hand over an envelope with their bid, lending formality and gravity to the event. Following introductions, the facilitator signaled to a notary to open a safe in view of the camera and pull out the first bid (see Figure 4.1). The sealed envelope was cut open, the facilitator silently reviewed the paperwork while spectators looked on, and then the price offered for each hourly block was announced, a process repeated for as many bids that were in the safe (CNE, 2022). When all bids had been opened and announced, the facilitator closed the event.

This event is not needed to determine the winners, and rather is organized to demonstrate the formality and transparency of the process.The digital submission of the bid is undertaken later, when the distributor company administering the tender manually enters details from each proposal into the software, followed by a validation process with CNE on the results generated by the software. The sealed envelopes pulled from the safe one by one and handed to the facilitator for review of the bidding price convey the idea that this is an open and participatory process in plain view of official and public witnesses. The revealing of each price in public also puts the focus on the fact that the prices inside the envelopes are all that matters.

Figure 4.1: Opening a sealed bid from the safe at a Chilean tender bidding event

Source: (CNE, 2022)

Source: (Bellini, 2021)

4.2.2. An algorithm that sorts winners and losers

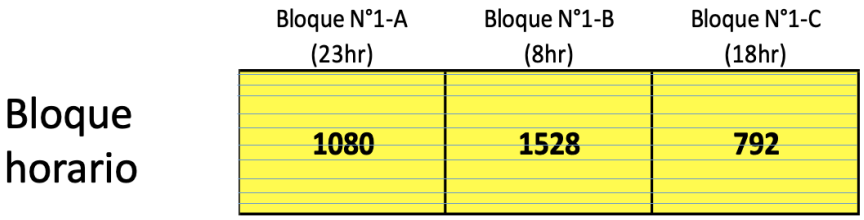
In Chile's tender system and that of other countries, the mechanism that is increasingly used to carry out the tender's assessment is an algorithm that calculates and sorts winners and losers following the state's design. The algorithm used by the tender brings a multitude of technologies and projects into alignment under one framework of measurement. The algorithmic calculation

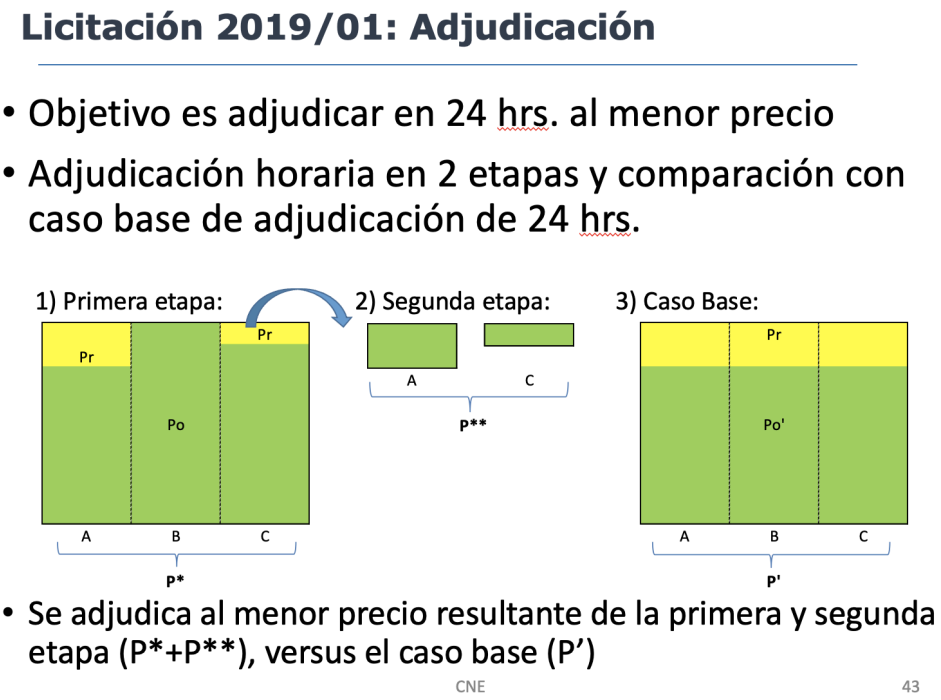
carried out by software is what the Energy ministry points to as evidence that their tenders have an ‘agnostic’ and ‘non-discriminatory’ approach.

However, algorithms are programmed by their owners and materialize their ambitions in powerful ways. The ‘ways in which market devices are tinkered with, adjusted and calibrated affect the ways in which persons and things are translated into calculative and calculable beings’ (Muniesa et al., 2007: 5). Data-driven tools for risk evaluation that facilitate green investment while entrenching racism and inequality have been characterized as ‘algorithmic violence’ (Safransky, 2020: 200). Algorithms produce ‘rules of association’ that have ‘begun to define the management of uncertain futures of many kinds’ (Amoore, 2009: 6) and the Energy ministry’s prioritization of price in its algorithm determines which entities are approved for engaging in this association. The reduction of a company’s bid to a number - a price - rather than also allowing for qualitative aspects as other countries do, makes the algorithmic calculation itself a possibility. The numerical and calculative nature of the algorithm removes the need for additional context or varied interpretation. It simplifies the decision to a simple process of sorting and ensures that ‘what step to take next is unambiguous’ (Hill, 2016: 43). This lack of ambiguity is what brings the state and investors into a relationship; the state offering the certainty of what happens next, and investors responding by channeling investments toward Chile.

The algorithm programmed by the CNE into the software is the manifestation of state intentions about which electricity suppliers to include and exclude. The algorithm creates alignment between the winning bidders; the state, which designs the tender rubric that informs the algorithm; and the distributor, which administers the tender, operates the software, and ultimately distributes the electricity produced by the winning bidder. The central algorithmic innovation in Chile’s recent tenders, the offering of timeblocks that span 24 hours of the day, does the work of binding these actors together. This innovation is credited for Chile’s success in breaking global records in the number of renewable energy bids and the lowest solar price. The 24-hour timeblocks formula (see Figure 4.2) allows the state to prioritize two aspects of incoming bids: price and renewable energy technologies. Due to the intermittency of solar, hydro, and wind technologies at certain times of day, allowing bidders to attach their supply to specific time blocks makes these more competitive alongside non-renewables. The software selects bids at the lowest price, but if blocks of time are not filled up, bids at higher prices are selected. Overall, this results in a somewhat higher price that covers 24 hours including renewables, and some of the cheapest bids are rejected. However, the software does prioritize lowest price, and secondarily blocks of time where renewables can compete. This effectively excludes all other potential factors, and ensures the state and distributor establish a relationship with the largest supply companies that can afford to offer lower prices regardless of technology. While the software is perceived to deliver a process of agnostic sorting, it is set up to include and exclude based on these particular parameters established by the state.

Figure 4.2: The 24-hour timeblocks innovation used to prioritize the lowest price, followed by renewable energy technologies





Source: Licitaciones y Mercado Eléctrico en Chile (Comisión Nacional de Energía 2019)

4.2.3. Contracts that bind the state and investors together for decades

Once bids are calculated and compared, and winning bidders identified, contracts are used to bind the state and investors for decades, despite the considerable uncertainty that exists in practice. Contracts stitch together the state and winning investors in the planning of electricity generation and plant development through to delivering services to end users. Power Purchase Agreements (PPA) demonstrate the state's commitment to a specific company.

Contractual relationships can be understood as the performance of an agreement that cements a relationship between parties (Clark and Monk, 2014). Contracts engage both public and private agency and represent 'nodes of articulation between legal and economic spaces' (Potts,

2016: 524). They are intended to remove ambiguity and frame interactions between parties, establishing ‘the world within which the action will take place.’ Yet contracts reside within ‘an infinite world of possible relationships.’ The elements that are included in this framing, whether tangible or intangible, are capable of being a ‘potential conduit for overflows’ such that ‘no contract is capable of, or has an interest in, systematically suppressing all connections’ (Callon, 1998b: 225). Contracts communicate a commitment to one particular path that is not expected to be altered or affected by elements outside the frame. But the process of drawing lines around what is included and excluded acknowledges the potential influence of elements outside the frame. And due to regular on-selling of contracts to other investors, the company that becomes part of the agreement, even in the shorter term, is largely out of the state’s control.

Contracts for electricity generation bind the Chilean state and investors together for decades. Power purchase agreements that legalize the relationship between the winning supply companies and the state and distributor obligate the supplier to provide electricity at the bid price over a 20-year period. The winning companies in 2017 secured contracts that will not be initiated until 2024 (CNE, 2017b), cementing a 27-year financial relationship. The price, technology, and start date of supply cannot be changed in the contract, with some exceptions. However, which project supplying the electricity can be altered if the CNE approves. The CNE then monitors the contracts and the development of projects through technical audits and a gantt chart on construction progress, reviews any requested modifications, and recommends penalties when the contract is violated. These contracts entrench winning companies over a long period of time, while excluding smaller companies that cannot compete due to the high risk of a set price and inability to switch out various projects to fulfill the supply requirements.

4.2.4. The essence of the tender

The employment of these objects ends up reducing energy systems to a standardized framing that is friendly to multinational companies and binding a narrow category of investors to the state over a prolonged period of time. These objects reveal the essence of the tender, which is to establish the appearance of agnostic decision-making; to deliver a reductive approach to energy systems, perpetuating a legacy of exclusion; and to drive financialization. Each of these functions is outlined in more detail below.

The tender’s first function is to produce the appearance of agnostic decision-making, lending legitimacy to the state. The various objects used to drive the tender are purposeful. The bidding event performed in public view demonstrates a transparent and orderly process open to all. The algorithm is portrayed as simply machine-driven sorting. And long-term contracts usher in a sense of security for the state and investors alike. This assemblage of objects allows the state to prioritize a market-based approach while simultaneously shifting its relationships from the domestic incumbents of the past to the international incumbents of the future. This shift may indeed be agnostic in terms of the specific companies winning bids, but the objects that drive the tender ensure that only a narrow type of investor can participate. The tender also lends more control to the centralized state by entrenching an approach to energy infrastructure

development that favors large-scale plants, since the winning bids are configured to rely on centralized transmission networks.

The second function of the tender is to deliver a reductive approach to energy systems. Analysis of Chile's recent tenders presented later in this chapter shows that a limited number of multinational companies with large-scale projects have dominated, pushing aside smaller and domestic companies that have less negotiating power and are not equipped to compete financially. The public bidding process is designed to narrow the field of contenders, the algorithm's narrow prioritization of price sorts out smaller actors, and long-term contracts favor the larger companies. These objects, organized by the Chilean state, drive the transformation of the multifarious elements of energy systems into a single value represented by each bid. The calculation of winners and losers based on this value is an erasure of all incommensurate elements outside the calculative frame, and with little embeddedness in the country itself. This delivers an energy system organized around large-scale plants owned by international companies.

The tender's third function is to move energy systems further down the path of financialization. Both the public bidding event and the algorithm's design favor multinationals that are arguably more motivated by investment potential than the electricity service provided. Chile's tender results show that over a matter of a few years the companies that win bids are not the ones implementing contracts. Long-term contracts may lend a sense of security to the state and investors. But given the normalization of on-selling, contracts do not provide any certainty as to which entities will provide electricity services to Chilean residential and small business electricity consumers for decades to come. The state's reliance on the streamlined tender is an endorsement of financialization, and in effect, an acceptance that the Chilean people will not have input into how energy is generated and delivered in their own territory (Potts, 2016).

With this understanding of the tender's essence and functions in mind, the empirical section that follows explores how the tender has been constructed and deployed in Chile, and shares results that emerge from analyzing the winners of Chilean tenders during the 2014-2020 period.

4.3. The world's most streamlined tender

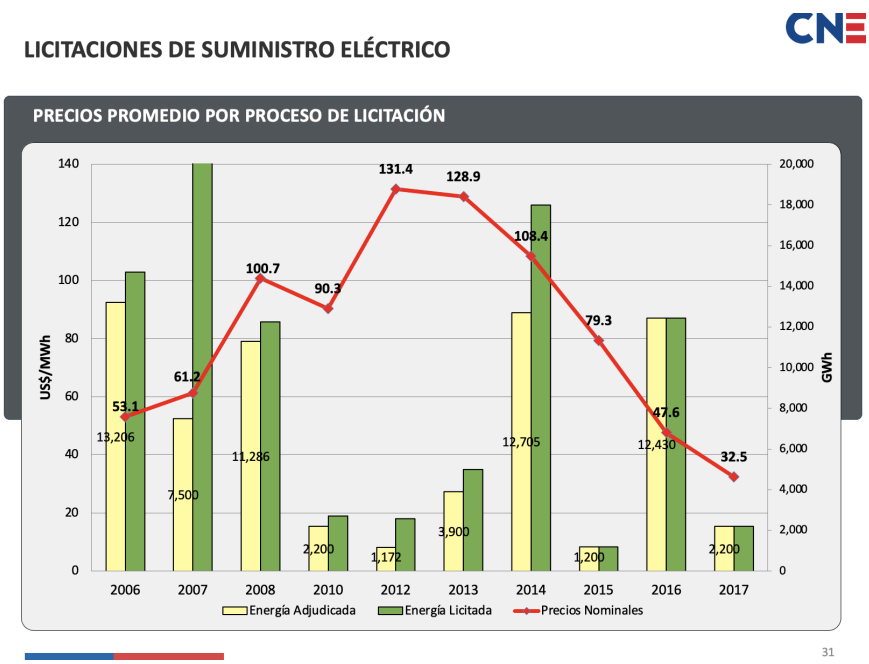
At a press conference held in Santiago, Chile in 2017 (see Figure 4.3), state and private leadership of Chile's energy sector jointly announced that the new tender system for attracting energy investment had achieved the world's lowest bid for solar generation, and half the price of coal (Bellini, 2017; Dezem, 2016). Minister of Energy Andrés Rebolledo declared, 'Today we can say with great calm, transparency and joy, we have managed to lower the price of energy by 75% in the last three years.' Sitting alongside him, the head of the National Energy Commission explained that 'tenders have proven to be an important way for the entry of new actors' and for attracting 'new and important investments,' and the head of the Association of Electric Companies confirmed that 'tenders are a key process to guarantee the electricity supply of Chilean families' (CNE, 2017b). Alongside the 75% price drop by 2017 (see Figure 4.4), the

number of bidders per tender had also shot up dramatically, with the broadest competition in 2016 bringing in 84 bids (Dezem and Millan, 2016). The 2016 tender was considered by the Chilean government to be the most successful due to the number of bidding companies, marking a shift away from the few incumbent fossil fuel companies that had dominated the market.

Figure 4.3: Press conference announcing Chile's achievement of lowest global price

Source: (CNE, 2017b)

Figure 4.4: National Energy Commission graph demonstrating price drop



Source: (Romero, 2017)

Alongside the state's celebration, the new tender system was lauded internationally by investors for generating an investment frenzy (IRENA, 2017). Financial advisory firms praised the stripping out of all requirements except that companies offer the lowest price, and removing all other potential factors related to utility-scale electricity generation. Bloomberg then ranked Chile as the highest performing emerging market on energy transition in 2018 (BloombergNEF, 2018).

Using tenders to attract investment was not new to Chile, a country that for decades has employed a market-centered approach in electricity procurement. In the 1980s, Chile was the first country globally to deregulate its power sector, and for years electricity supply was arranged through a system of contracts based on regulated prices (Maurer and Barroso, 2011). Tenders were first introduced in Chile's regulatory process in 2005 after Argentina cut natural gas exports and tariffs were considered inflexible. The Chilean government's intention was to attract investment in new capacity and establish long-term contracts that would provide more reliable supply and prices (Bustos-Salvagno, 2015). During this period, tenders were designed and managed by the distributor companies, which used their own criteria to select generation companies to supply electricity to each distributor's regulated markets. Tenders at the discretion of distributors allowed generation companies to submit multiple bids to distributors according to their preferences, resulting in highly variable contracts and prices across the country. Distributors were over-projecting and over-contracting supply to avoid the state's financial penalties for insufficient supply, driving up prices. While tenders were held almost annually since 2006 (IDB, 2019), new investment remained limited with an average of 3 bidders per tender and prices continued to rise (Bustos-Salvagno, 2015). Though participation requirements were very

minimal under this design, only the incumbent generation companies could compete (IRENA, 2017) and prices continued to rise from 2006 through 2013.

The Tender Law (*Ley de Licitaciones* 20.805) brought about a significant consolidation of the tender process into the hands of the central state. This law was a key component of President Bachelet's effort starting in 2014 to further propel Chile's market-based approach to energy generation procurement as well as strengthen central state control through *Energia 2050*, as described in the introduction chapter. Securing more control of the tendering system allowed the Energy Ministry to take back control of selecting electricity generation bids from distributors, while attracting utility-scale renewable energy infrastructure at lower prices. An arm of the Energy ministry, the CNE would now be contracting electricity supply to match the state's priorities, and in 2015 a Tender Unit was established within its Department of Economic Regulation. The Tender Unit would coordinate the overall tender process, calculate a projection of the country's electricity demand for 15-20 years ahead, and establish a rubric for selecting winners. For each tender, one major distributor is charged with administering the process and selecting winners following the state's rubric. While this consolidation of the tender into a single and centralized process under the Ministry was a significant change, plenty of aspects of the country's tender design remained the same, such as a narrow focus on bidding price, no distinction between existing plants and building new generation, a technology-neutral approach that allowed renewables to compete against fossil fuels (Maurer and Barroso, 2011), and minimal participation requirements.

The new state-controlled tender perpetuated distinct design choices, beginning with a focus on price. Compared to other countries in Latin America, criteria for selecting bids under Chile's tender system have been the most stringently limited to price (IDB, 2019). At the exclusion of most other criteria, bidders in the Chilean tender system are only required to submit proof of their risk rating and financial solvency, incorporation of a specific-purpose company in the country, and minimal technical documentation such as grid connection plans (IRENA, 2017). International developers are drawn to this narrow approach, due to the understanding that 'prequalification requirements can deter speculative bidding' (IDB, 2019: 12). Other countries have used sophisticated design elements to address additional objectives beyond price (Lucas and Gómez, 2017), while others have set very limited objectives (IRENA, 2017). Brazil requires evidence of grid access, environmental permitting and impact assessments, and land use rights (IDB, 2019). South African proposals must include a South African institution and address socio-economic criteria, including partial ownership by Black-owned companies, community shareholding, and job creation (Baker, 2015, 2021). Only Mexico, another leading market for renewable energy investment in the region, comes close to Chile's minimalistic criteria for bidding on utility-scale infrastructure (IDB, 2019). Chile's tenders also allow bidders five years to complete projects, which may facilitate more investor speculation as technology costs decrease over time (IDB, 2019).

The revamped Chilean tender also prioritized large companies and disadvantaged small and medium companies. Flexibility with contract start dates is effectively a barrier to entry for small and medium size companies. When plant generation doesn't reach the contracted quantity,

companies are required to fill the gap by purchasing supply through the electricity spot market, which can mean unpredictable prices. Generators are now allowed to delay a contract start date in certain cases, rather than rely on the electricity spot market. Longer term contracts can reduce this price volatility for larger investors, but this change does not help smaller companies that do not have a diversified portfolio and financials to withstand this risk (IRENA, 2017). Another aspect of the tender that narrows the field is that Chilean tenders are only attached to the regulated market. In Chile, the regulated electricity market serves small and medium size businesses and residences[4], which in 2016 represented 60 percent of the country's electricity consumption (Ministerio de Energía, 2016a), while the non-regulated electricity market serves large industrial entities such as mining companies. Thus, the electricity needs of small and medium businesses and residences are bound up with the tender system, while large industrial companies can make private agreements directly with generators.

The Chilean state also offered other elements to make the Chilean electricity market attractive to large developers. Chile's tender system put renewable energy on an even playing field with fossil fuels by awarding generation contracts for intraday and quarterly blocks and for 24-hour generation, which allowed companies offering solar and wind to submit bids for hourly blocks where they were most competitive (IDB, 2019). The Bachelet administration also pledged to interconnect the country's grids and improve infrastructural capacity through a new Transmission Law, responding to significant deficiencies of Chile's grid that often crippled transmission capacity and made pricing more volatile. The new law reduced the costs and risks for investors, and attracted more tender proposals, by altering who pays for transmission, shifting this from generators to consumers (del Rio, 2017). In addition, Chile offers investors an environment in which there is little or no land use regulation, macroeconomic stability and integration with global capital markets, low taxes, and a simplified foreign investing process (del Rio, 2017). For these reasons, multinational renewable energy companies have characterized Chile as the world's PPA creation ground, using Chile to test out the tender process and then export that experience to investments in other countries (Enel, 2021).

4.3.1. Results of the state-controlled tender device

Analysis of the results of multiple rounds of the Chilean tender during 2014-2020 reveal that it succeeded in aligning the state's procurement process with the interests of international investors. While Chile's legacy of deregulation laid the groundwork for the trajectory of the country's energy market, the new tender process took this approach one step further by securing a parade of financialized renewable energy infrastructure. The details of these findings are outlined in this section.

In sum, the new tenders positively increased solar and wind generation in the country's energy matrix, but they also delivered ownership of Chile's utility-scale renewable energy infrastructure to a small number of companies and investors based outside the country. The data shows that

[4] Entities using 0-500 KW are regulated. Entities using above 5 million KW, signifying large-scale industry use, are non-regulated. Entities using 500 to 5 million KW can choose to be regulated or non-regulated.

renewable energy contracts facilitated by the new tender system are held almost entirely by non-Chilean, and primarily European, firms. Secondly, this ownership is concentrated among a small number of large multinationals. And third, the data points to a rampant on-selling of projects after bids are won. The throughline from the objects of Chile's tender device outlined in Section 4.2 to these results is apparent. Chile's performative bidding process and algorithmic sorting of winners and losers succeeded in narrowing the field of contenders and ushering in an energy transition that is wholly owned by global financial actors. Long term contracts ensure that the Chilean central state and these types of financial actors will stay in close relationship over decades.

The first finding is that new state-controlled tender resulted in non-Chilean and primarily European companies being awarded most of the country's generation potential. In this way the Chilean tender functions as a device aligning disparate elements (Loconto, 2015) and judging which actors can or cannot be involved (Hatanaka et al., 2005). Over the course of five tenders organized by the CNE between 2014 and 2020 (see Figure 4.5), contracts were overwhelmingly and consistently awarded to multinationals from the outset. By the second tender in 2015, Inter-American Development Bank noted that Chile was the only country in Latin America (with Mexico close behind) where foreign companies and their subsidiaries were awarded 100 percent[5] of projects (IDB, 2019). By the latest tender in 2020, around 85 percent of the awarded generation potential (in MW) was in the hands of European companies, and less than 5 percent owned by Chilean companies. The countries represented in ownership of this infrastructure, in order of amount of generation potential awarded, are Italy, Ireland, US/UK, France, Spain, Norway, Germany, Saudi Arabia, Brazil, Kuwait, Swiss, and Canada (see Figure 4.6).

The second finding is that, alongside ownership by European companies, contracts during this period were concentrated among a small number of multinationals. This concentration became more pronounced over time as those same companies won additional tenders. In the first tender in 2014, with around 20 generation projects, close to 71 percent of the tender was won by three companies: Engie and EDF of France and Acciona/Abengoa of Spain. In each of the next three tenders, one company was awarded over half of the generation potential: Mainstream of Ireland with close to 55 percent in 2015 (a tender awarding about 15 projects), and Enel of Italy with around 52 percent in 2016 (a tender awarding around 29 generation projects) and 88 percent in 2017 (a tender awarding around 26 projects). In the 2020 tender, four companies won over 81 percent of the generation potential: Enel of Italy, Statkraft of Norway, and Engie and EDF of France. One company, Enel, dominated across the five tenders, securing close to 52 percent ownership of Chile's generation potential by 2020. Enel is the largest electric utility in Chile, and together with CGE (later owned by China's state grid) manages the highest share of the country's electricity distribution (CNE, 2020). While the tender offers the state the appearance of agnostic decision making, the clear consolidation of winning bids among a small number of multinationals confirms the state's intentions in using this device. And the calculative nature of the device also contributes to these intentions, by allowing investors to disentangle projects

[5] The IDB's analysis does not take into account that while the US company SunEdison won the original bid, the contract was then sold to Chilean company Colbun.

from their settings (Callon, 1998b) and transform them into abstract prices that strip away all context (Bulkeley, 2015; Lansing, 2012).

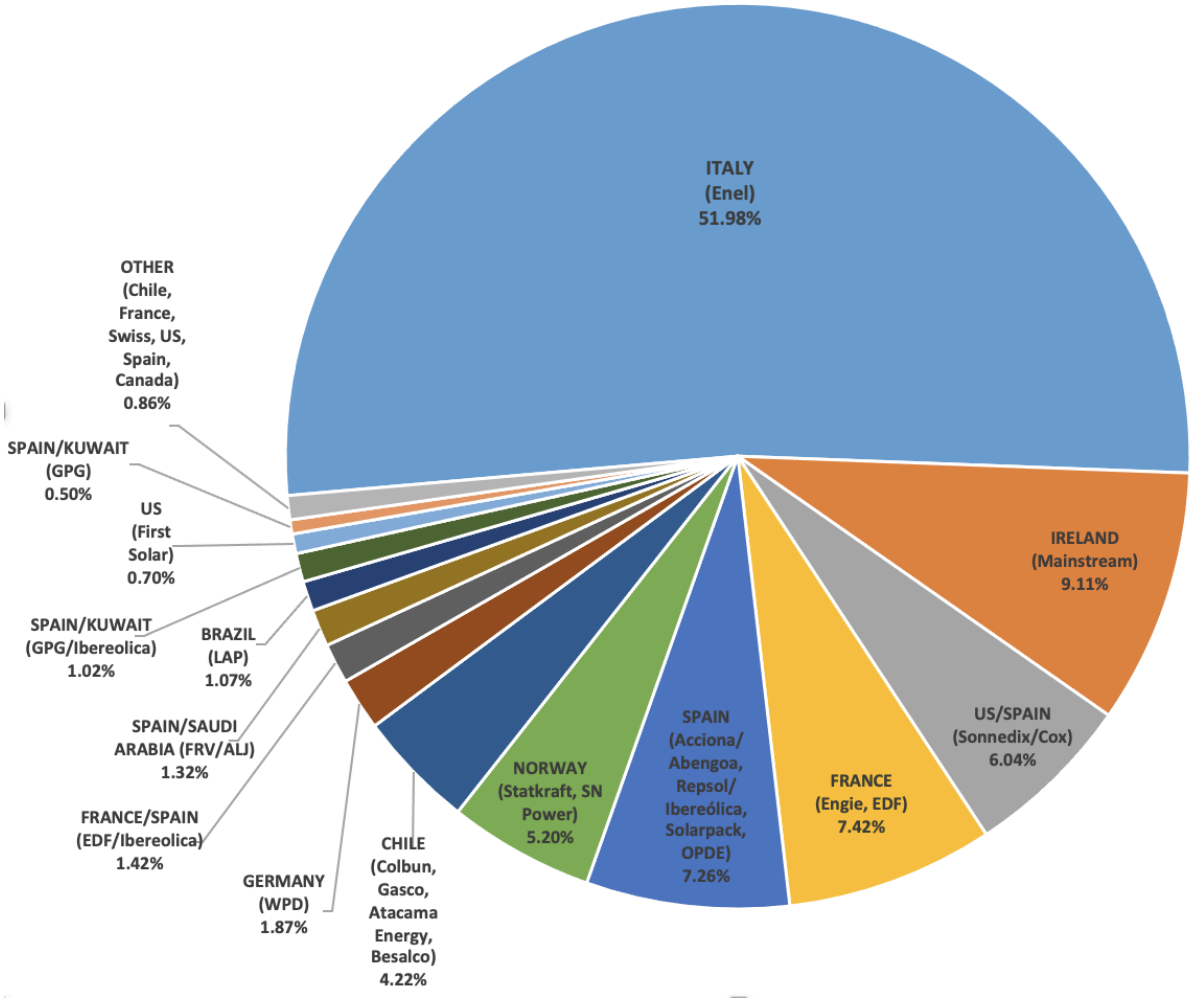
Figure 4.5: Proportion of MW awarded per tender, by company of 2021 ownership, for Chilean tenders 2014-2020

2014	2015	2016	2017	2020
Engie (France) 28.54%	Mainstream (Ireland) 54.76%	Enel (Italy) 52.33%	Enel (Italy) 88.23%	Enel (Italy) 25.42%
EDF/Enel (France/Italy)[1] 21.38%	Acciona/ Abengoa (Spain) 16.25%	Mainstream (Ireland) 16.72%	Sonnedix/Cox (US/Spain) 6.24%	Statkraft (Norway) 32.64%
Acciona/Abengoa (Spain) 20.98%	EDF/ Ibereolica (France/Spain) 13.14%	Sonnedix/Cox (US/Spain)[2] 10.36%	FRV/ ALJ (Spain/Saudi Arabia) 4.18%	Engie (France) 13.25%
Colbun (Chile) 12.47%	First Solar (US) 10.90%	WPD (Germany) 5.62%	Atacama Energy (Chile) 1.37%	EDF (France) 10.03%
LAP (Brazil) 7.66%	Solarpack (Spain) 4.95%	Acciona Abengoa (Spain) 4.04%		Colbun (Chile) 8.64%
AME/EDF (Chile/France) 3.30%		GPG/Ibereolica (Spain/Kuwait) 3.05%		Gasco (Chile) 5.08%
Etrion/Total/SunPower/ Solventus (Swiss/US/France/Spain) 2.49%		Repsol/Ibereolica (Spain) 2.04%		Sonnedix/Cox (US/Spain) 3.93%
SN Power (Norway) 1.64%		EDF/Ibereolica (France/Spain) 1.73%		Solarpack (Spain) 0.64%
Statkraft (Norway) 1.23%		GPG (Spain/Kuwait) 1.51%		Distributed Power Partners (Canada) 0.34%
Sonnedix/Cox (US/Spain) 0.32%		Solarpack (Spain) 1.50%		
		OPDE (Spain) 1.02%		
		Besalco (Chile) 0,09%		

[1] EDF won the contract, but Enel fulfilling supply for 5 years

[2] Cox is majority owned by Sonnedix, but seems to retain brand

Figure 4.6: Proportion of MW awarded, by owner's country headquarters as of 2021, across all five Chilean tenders 2014-2020



The third finding based on data analyzed for these tender rounds is that on-selling of generation potential awarded through the tender system is commonplace. In effect, the companies implementing the projects are not necessarily the companies that won the tender. Looking at the 2014 tender, for example, the majority of generation potential awarded will not be supplied by the companies that won the contracts. Only three out of eight winners of the 2014 tender, Latin American Power, Acciona, and Engie, were projected to fulfill their contracts as of 2017. Two of the contracts awarded through the 2014 tender, representing 41% of the total energy awarded, were transferred to other companies, one to Enel temporarily and the other to incumbent energy company Colbún of Chile, which as of 2017 had not committed to build the renewable energy plants in the contract. Similarly in 2015, awarded generation potential was transferred to other companies, although at a smaller scale (Revista Electricidad, 2017). In the 2016 tender, Spanish company Cox was awarded several major contracts, but in the following year the company was acquired by Sonnedix, which is majority owned by institutional investors advised

by J P Morgan Asset Management and headquartered in the UK (Cox Energy America, 2021; Sonnedix, 2017).

The regularity of on-selling reaffirms that the tender is a device catalyzing a trajectory toward financialization. The Energy ministry's 2014 adaptation of the tender process to attract the lowest price allowed only multinational firms to succeed. This is not a new path for Chile, which has served as a model of neoliberalism in diverse sectors (Ruiz Bruzzone, 2021), a legacy of the Pinochet dictatorship and his Chilean 'Chicago Boys' who initiated the country's first rounds of privatization and deregulation (Kingsbury, 2022: 2). New investment in Chile's energy systems has been characterized as demonstrating the 'reproduction of specific regimes of accumulation' (Furnaro, 2019: 19) where reactivation of the Chilean state to create more competitive tenders is an example of reregulation strategies meant to expand the state's role in marketization (Bridge and Jonas, 2002). Maillet and Rozas (2019) refer to this process of the state placing itself at the service of investment competition as neoliberal hybridization. In their view, the transformation ushered in through the new energy agenda was not a major paradigm shift, as the neoliberal essence remained the same. This is far from a new endeavor for the Latin American region either, which is already in an advanced stage of financialization (Correa and Vidal, 2012) and where assets are highly concentrated among a limited number of companies (Leiva and Malinowitz, n.d.). After Mexico, Chile has the highest capital penetration of foreign banks in the region (Perry, 2019).

This dependence on transnational capital for energy infrastructure reinforces Chile's legacy of centralized governance, an indication that the tender device lends further legitimacy to the power of the central state. Since colonial times, authority has always been highly concentrated at national scale in Chile, and this was further cemented during the Pinochet dictatorship (Vial Cossani, 2016). As noted by Flores-Fernández (2020: 187), 'the incorporation of renewables to the energy matrix has not... implied an advance towards democratic and decentralized energy systems that promote local development and the effective participation of communities in energy decision-making.' Chile's centralized path could then preclude alternate paths of distributed generation, municipal leadership, or community ownership that might deliver a more transformative energy transition. As of 2018, Chile had only .014 GW of distributed solar energy, compared to 20 GW in Germany (Borregaard, 2018a). In the view of a former Energy minister, 'centralization suffocates' Chile's ability to pursue a more transformative transition (Revista Electricidad, 2018).

4.4. Reducing energy systems to a standardized framing

This chapter interrogated the project's second research question, the role of the central state in making energy markets and attracting investment. The realities of the state's role are unveiled by investigating the primary device, the tender, that has been used to procure utility-scale electricity generation in Chile. A proxy for the state's aims, the essence of the tender is to reduce energy systems to a standardized framing that fulfills the investment preferences of multinational companies, and to bind investors and the state together over a prolonged period of

time. The Chilean tender confirms the device's role in actively creating markets, propelling financialization, and commodifying energy systems.

Chile's streamlined version of the tender demonstrates the device's truest purpose of reducing energy systems to a standardized framing, an expression of the state's vision of energy transition. This case provides a new example of a calculative device employed in energy transition, linking to component 3 of the conceptual framework, as well as the objects of the tender as outlined in Section 4.2 that are crucial to the device's influence. Sealed bids are opened and unveiled in performative events that evoke the theater (Callon, 1998b) or a conjuring (Tsing, 2000) in order to convey certainty and legitimacy, to narrow the field of contenders, and to reveal the singular element of price that will win the bid. The algorithm that sorts winners and losers is also used to narrow the focus to price, as it is incapable of choosing a winner by calculating qualitative aspects of energy systems and thus other factors that could be considered in choosing electricity generation projects are ignored. And long-term contracts bind the state to investors over time, entrenching existing types of financial actors while excluding smaller companies that cannot compete. The results of these design choices are that most projects are awarded to multinationals based outside of the country, concentrated among a small number of multinationals, and projects are frequently sold after they are won.

The hyperconcentrated multinational ownership of Chile's generation plants entrenches a pathway that prioritizes large-scale centralized infrastructure and perpetuates a legacy of exclusion of domestic and smaller actors. As the organization REN21 observed about Latin America's tenders, 'an unintended consequence of the renewable energy tendering process has been the de facto exclusion of a range of actors, including small business, communities, indigenous people, local government, property developers and farmers' (REN21, 2017: 3). The way that Chile's tenders are designed makes it impossible for a medium or small company to compete, which has accelerated the consolidation of smaller solar companies into very large ones. These tenders have delivered a fleet of large-scale centralized plants that are only attractive to multinationals and speculative investors. Chile is now host to some of the largest renewable energy projects in the world, among them the Horizonte wind plant at 607MW (Azzopardi, 2020) and the Condor solar plant at 571MW (Molina, 2020). Large-scale centralized generation limits opportunities for local ownership and channels resources out of the country (Kennedy, 2018), such that the tender processes of utility-scale electricity 'have contributed to existing relations of inequality and nationally specific pathways of historical marginalisation' (Baker, 2021: 20). Chile's performative bidding process and algorithmic sorting of winners and losers has thus succeeded in narrowing the field of contenders and ushering in an energy transition that is wholly owned by global financial actors.

Looking to component 1 of the conceptual framework focused on political economy, this investigation of the Chilean tender elucidates its close alignment to and responsiveness to the needs of investors (Newell and Phillips, 2016). The tender allows the state to privilege existing financial models and incumbent actors (Baker, 2015) and to move governance of energy systems toward deeper financialization. As judged by its actions through the tender, the state prioritizes price as the sole criteria for deciding who can invest in Chile's energy system, while

all other elements, concerns, or challenges are excluded from that calculation. In this way the state erases any ambiguous factors (Lansing, 2012) that would be problematic for investors, and transforms the country's energy system into a series of uniform metrics that have been made the same (MacKenzie, 2009). The Chilean state's role in attracting investment through the tender also undergirds existing scholarly challenges to the idea that there is a clean division between the state and market (Johnstone and Newell, 2018) or that states are nationally bounded (Baker, 2021).

Chile's version of the tender is part exemplar, demonstrating what the tender is truly meant to accomplish. But it can also be seen as an exceptional case in its extreme exclusion of all other aspects of energy systems, a device that allows companies to invest with 'no strings attached' to on-the-ground realities. The tender is often perceived as an agnostic or non-discriminatory innovative investment tool, but the present account confirms that the tender is a device that states use to move energy governance into a financialized market. The Chilean case raises questions about whether states can successfully usher in renewable energy investment while also achieving socio-economic outcomes, and whether they have the capacity to do so (Baker, 2021). Latin American countries and others across the Global South have not been able to alter the tender enough to sufficiently achieve other objectives such as job growth, economic development, or empowerment of local communities or specific underrepresented populations. While there are calls for understanding the financing of new energy infrastructure so that it can be adjusted to also deliver on non-economic goals (Castree and Christophers, 2015), this chapter demonstrates that the tender is a device that seems unbendable for this purpose.

Building on this chapter's investigation of the role of the central state in making energy markets, as well as the previous chapter's discussion of investment directions constructed at the regional scale, the next chapter pivots to the subnational scale, documenting a distinct approach to energy transition promoted by the local state. Through an examination of a municipality's attempt to pursue localized energy agendas, the chapter explores dynamics of the Foucauldian concept of *dispositif* to understand local governance capacity as well as relational configurations between the subnational and central state. Parallel to tender processes at the national scale, examining an alternate agenda at the subnational scale illuminates the possibilities and limits of municipal power and the extent to which the local state is able to set the terms of its energy future.

5. Reconfiguring Renca: Dispositif and the (de)centralization of energy transition

Against the backdrop of how global financial actors and the central state discursively construct energy markets, the present chapter brings to light the distinct positioning of the local state. It investigates the project's third research question, *To what extent are subnational actors able to determine their own energy future?* For countries seeking to accelerate energy transition and achieve climate goals, collaboration between national and city governments on the decarbonization and decentralization of urban power systems is critical (Broekhoff et al., 2021). However, this chapter's examination of the distinct energy transition vision and efforts of the *comuna* of Renca, undertaken in the context of Chilean national regionalization processes, reveals how the *comuna's* power and capacity is constrained by actors operating at other scales. This chapter's investigation of energy transition at the subnational scale thus demonstrates the value of a multiscalar analysis of energy transition pathways.

The extent to which cities in the Global South can determine their own future is shaped by international financial actors and the central state. As outlined in component 4 of the conceptual framework, global financial actors seek to reformat (Bigger and Webber, 2020) and decode (Hilbrandt and Grafe, 2022) cities to clear a path toward investability. Investment in local energy projects often comes at the cost of entrenching existing financing pathways and existing inequalities (Bigger and Millington, 2020). This leaves certain municipalities 'doubly disenfranchised' and deepens inequalities they experience compared to municipalities that are better resourced (Hilbrandt and Grafe, 2023). Subnational governance is also influenced by the central state, and component 1 of the conceptual framework is relevant to the chapter's investigation of this dynamic by contextualizing the dispersed and unsettled nature of state power and urban governance (Bulkeley and Schroeder, 2012; McGuirk and Dowling, 2020) and the 'relational configurations' between diverse actors (McGuirk et al., 2016: 3). To better understand the coherence of diverse elements and actors that make up the dispersed nature of state power across scales, this chapter employs the concept of *dispositif (Agamben et al., 2009; Bracking, 2019; Foucault, 1980; Fredriksen, 2015; McGuirk and Dowling, 2020)* highlighted in component 3 of the conceptual framework. This concept helps to unravel the complexity of a comuna's positioning within the governance of Chile's energy transition, pinpointing the ways in which global financial actors and the central state impede the realization of locally grounded energy visions.

This chapter explores how the local came to matter in Chile's energy transition, through the lens of Renca's pursuit of local energy initiatives, providing a window into the possibilities and limits of municipal power in the Chilean context. Section 5.1 explores the emergence in Chile of a subnational agenda on regionalization of energy governance, then explores how Renca articulated a more transformative vision for energy governance at the local scale. Section 5.2 similarly looks at the national program on local energy planning, and then outlines how Renca configured its local energy plan to situate the comuna as a site of innovation. This is followed by Section 5.3 examining Chile's pursuit of local electricity generation infrastructure, and Renca's attempt to be selected as one of the first district energy pilots. Section 5.4 then delves deeper

into how the Chilean regionalization agenda works through a *dispositif*, particularly looking at evidence of the coherence of diverse elements that generates capacity to govern, the existence of *power over* Renca's municipality, and the extent of settled power. The concluding Section 5.5 explores how the *dispositif* lens contributes to our understanding of local energy transition, and the prospects of comunas securing the capacity to set the terms of their own energy future.

5.1. Regionalization of energy governance

New efforts around regionalization of energy governance have emerged at the national scale in Chile, designed by the central state and driven by public protest and social and environmental movements. This section provides an account of how the Chilean central state, in response to a crisis of state legitimacy, pushed for decentralizing governance to the regional and local levels, and how in this context Renca pursued a more transformative approach to local energy governance by elevating the impacts of air pollution and energy poverty, confronting the state's approach to energy access.

5.1.1 The rise of Chile's regionalisation agenda

Beginning a decade ago, Chile's centralized governance structure increasingly contributed to a crisis of state legitimacy in managing the energy sector. Public discontent was growing around the state's handling of environmental and social concerns, and resistance to the existing energy regime was couched in the growing view that the country's elite and the private sector were the primary beneficiaries of Chile's recent economic development. In tandem, a powerful social movement was opposing new fossil fuel and hydroelectric projects and bringing attention to air pollution and climate change. The consultative process *Energy Scenarios: Chile 2030* emerged to articulate the need for a more participatory mode of governing Chile's energy sector (Escenarios Energéticos, 2018). A wave of massive public protests against the HidroAysen project blocked the development of 2750 MW of dams in Patagonia (CCTP, 2011), among other projects that were halted. And the Technical Parliamentary Citizen Commission (Comisión Ciudadana Técnico Parlamentaria or CCTP), a parliamentary commission made up of the public, technical experts, and parliamentarians, was formed to address Chile's multidimensional crises of air pollution, high energy prices, transmission congestion, and excessive concentration and lack of transparency in the electricity market (CCTP, 2011).

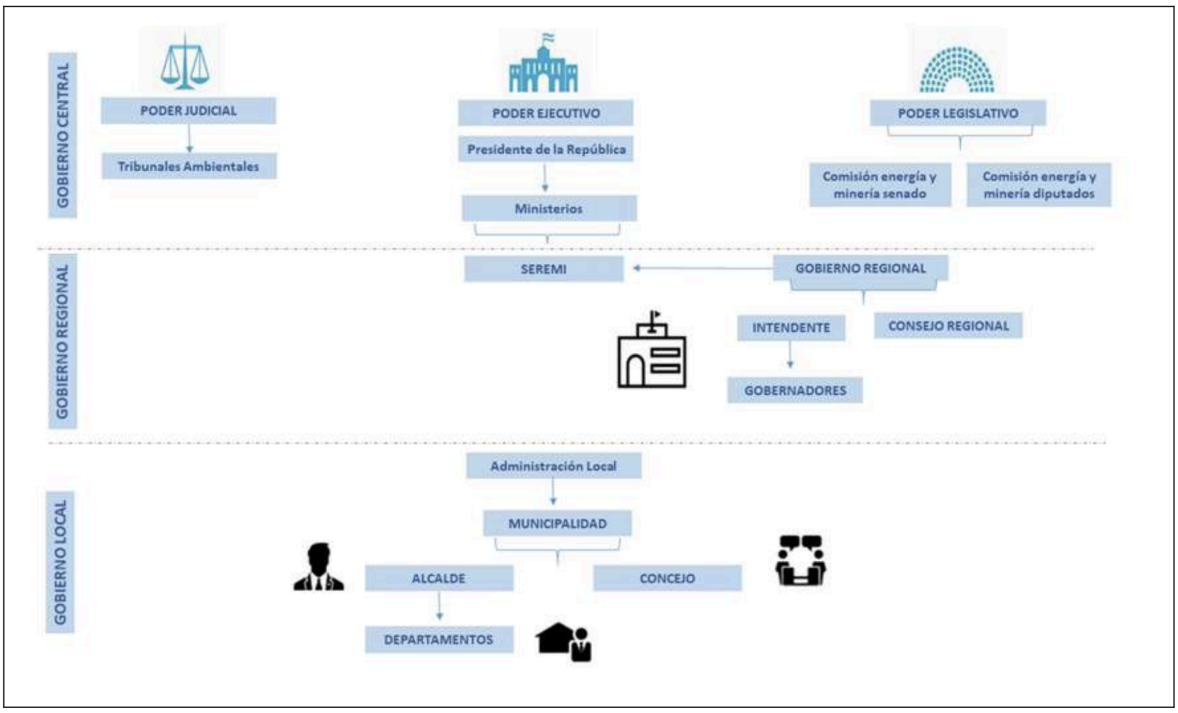
Amid this public backlash, the *Energía 2050* agenda emerged in 2015 (Ministerio de Energía, 2016b). Alongside a consolidation of control within the central state, *Energía 2050* articulated a greater role for regional and local governance in Chile. *Energía 2050* was lauded for setting a goal of generating 70 percent of electricity from renewable sources (Dezem, 2015). Simultaneously it was praised for ushering in a new model of participatory planning in its development, engaging over 3,000 stakeholders representing diverse sectors and the public over a period of 1.5 years (Ministerio de Energia, 2016). Although, for some environmental and social activists the participatory element was criticized as superficial and not resulting in

meaningful input (Allain and Madariaga, 2020). Several guidelines within the resulting energy agenda focused on the subnational scale and decentralized pathways, for example that regional planning should promote decentralization, developers should ensure that projects protect and empower regional values, and the state should facilitate this protection and empowerment (Borregaard, 2018b). Another of these guidelines promoted the role of small producers and communities in taking advantage of the energy resources of their territories (Ministerio de Energía, 2016b).

Attention to regional governance in *Energía 2050* (Ministerio de Energía, 2016b) and in the work of the Energy ministry was driven by signals that regions would be gaining more autonomy from the central state in the near future (Borregaard, 2018b). At the time, there was a legislative proposal to give regional governments more authority to determine energy priorities and improve coordination with the central government, a new Presidential Commission on decentralization, and the CCTP proposed to 'establish energy sovereignty as a pillar of decentralized energy development, which entails delivering autonomy to the regions' (Borregaard, 2018b: 178). Given centralized control of the electrical grid, and mismatch between supply and demand at regional level, the Energy ministry was wary of a scenario in which every region would call for renewable energy sources and disrupt the existing national balance of supply and demand. Thus through *Energía 2050* the ministry sought to tackle national governance and regional governance simultaneously (Borregaard, 2018b).

The instruments used to pursue this regionalized energy agenda demonstrate the agenda's limitations. Regional Energy Plans and Regional Ministerial Secretariats (SEREMIs) were introduced as new instruments to strengthen regional governance. Under the supervision of the Energy ministry, three regions in Chile developed Regional Energy Plans by 2014, and five more regions were in development by 2017 (Borregaard, 2018b). However, they were criticized for being developed separate from national energy planning. SEREMIs were similarly limited in their ability to integrate energy planning across scales. The Energy ministry assigned SEREMIs to implement centralized policies and programs in each region, and to be in attendance when the developers of large energy projects presented their plans at municipal level. But SEREMIs were not tasked with facilitating bidirectional coordination that might surface subnational energy needs to the national scale. National policies were still being established without a mechanism, through the SEREMIs or otherwise, to reflect municipal priorities. Figure 5.1 demonstrates the positioning of SEREMIs within the regional government while being clearly subservient to ministries of the central state.

Figure 5.1: Positioning of Regional Ministerial Secretariats (SEREMIs)



Source: (Gobierno Regional Metropolitano, 2018a)

5.1.2 Renca's alternative energy transition vision

In parallel to this national effort to regionalize energy governance, the comuna of Renca articulated a more transformative vision for energy governance at the local scale. While Chilean municipalities may not always prioritize energy issues in their efforts to improve local autonomy, Renca has uniquely elevated the negative impacts of the country's centralized energy agenda on the comuna. By calling attention to the localized impacts of air pollution and energy poverty, the municipality demonstrated the shortcomings of a national energy agenda that doesn't center the needs of the subnational scale. This section outlines how this alternative vision informs Renca's positioning within the *dispositif* as an actor that is seeking approval for an energy pathway that conflicts with the expectations of its national and international partners.

The comuna of Renca has long been acutely exposed to air pollution, energy poverty, and other energy-related injustices. As described in greater detail in the methodology chapter, Santiago's major power plant is located in Renca and for decades was the prominent source of air pollution in the city and throughout the country. The plant was built in 1962 at the periphery of the capital to reduce energy losses in transmission to the city, and is credited for sustaining the capital through crises such as when Argentina cut off Chile's gas supply in 2004 (Emol, 2004). In addition to hosting the 'Renca' and 'New Renca' power stations, the comuna is the site of the country's largest industrial zone, is adjacent to the national airport, and more than a quarter of its residents live in poverty (CASEN, 2015). Historically serving as the single backbone of

Chile's electricity supply, the plant is a negative stigma for the comuna while also symbolizing Chile's centralized energy governance.

In December 2016, a new administration was elected in Renca that began to raise awareness that Renca experienced significant air pollution but was deprived of resources to address the impacts. Upon taking office, Mayor Castro's administration argued that Santiago and the country have enjoyed energy services, and the economic development that comes with it, at Renca's expense. While Renca has never been supplied with a local monitoring station to identify the level of exposure that the comuna has experienced over the years, the plant produces air pollution that is represented symbolically in the minds of Santiago residents by images of soot-darkened laundry hung out to dry (Velásquez, 2018b). Despite being converted from coal to diesel after Santiago established the city's first air pollution plan in 1997, and no longer the country's primary source of electricity, pollution from the plant remained a shadow over the comuna.

Renca thus sought to classify its experience as one of Chile's 'sacrifice zones,' comunas experiencing significant industrial pollution that have been abandoned by the central state. Often understood as areas sacrificed in service of 'dominant national economic or energy logics' (Little, 2017: 1) or military uses, the term sacrifice zone has also been used to understand locations around energy infrastructure in urban settings (Castán Broto and Sanzana Calvet, 2020). Mayor Castro proposed a national environmental justice law in September 2018, which came to be known as the Renca Law, placing Renca alongside other comunas in Chile that in 2015 had declared themselves sacrifice zones due to pollution from energy plants (AdPrensa, 2018; Fajardo, 2018). At the time, Renca's plant was owned by AES Gener, which also owned plants in the established sacrifice zones of Quinteros and Puchuncavi (LID-Chile, 2018). The proposed Renca Law was based on the premise that municipalities should be compensated for air pollution in their territories, redirecting the existing national 'green tax' from plants that emit pollutants. In 2017 alone, the company operating Renca's plants paid close to USD $5 million in green taxes to the central state. Instead of this tax being channeled to central fiscal coffers, the Renca Law proposed to channel the majority of these resources toward the comunas most affected by the plants, to fund environmental projects, establish pollution monitoring centers, and build bargaining power for municipalities in their relations with plant companies (Fajardo, 2018).

Renca has also challenged the existing centralized energy agenda by rejecting the idea of grid access as the sole measure of successful energy systems. Chile greatly expanded rural access to the electrical grid in a relatively short period, moving the country from 50 percent access in 1994 to 99 percent access by 2023 (Toro Ortiz and Muñoz Zurita, 2023). Despite this impressive expansion of households connected to the grid, the more nuanced aspects of energy poverty have not been sufficiently addressed. This includes dependence on fuelwood among grid-connected households in southern cities due to high electricity costs, and quality of supply and blackouts throughout the country. Since the threshold for access is set so low in Chile, largely a test of grid access, dominant measures of energy access mean that 'almost nobody is energy poor' (Urquiza et al., 2019: 1), drawing criticism that 'energy poverty is not a concept that

exists within Chilean public policy' (Agenda País, 2019). Rather than addressing these more nuanced questions of access, the Energy ministry often remained focused on extending electricity access to remote rural areas, particularly the small number of homes without grid access or those with only partial access (Cuadra, 2019).

In support of this alternate vision of energy priorities, Renca and its partners engaged in an effort to promote a locally derived understanding of energy access. In 2017, Renca launched a pilot program to redefine energy poverty in its own context, at first looking to assess the extent of high energy costs. While most *comunas* in the Santiago Metropolitan Region record close to 100 percent electricity access, and Renca comes close to this, it has been the *comuna* with the highest number of persons without access to electricity (CASEN, 2015; Gobierno Regional Metropolitano, 2018b). Evolving from a municipal partnership with Bern, Switzerland, Renca engaged the Swiss embassy to fund a study of 18 households in Renca examining energy costs and testing out efficiency measures such as new appliances, led by consulting firm EBP. The program found that, despite residing next to Santiago's only power plant, poor households in Renca face extreme cold in winter and extreme heat in summer, due to low quality housing construction, causing some households to direct over 10 percent of their budget to energy costs (EBP, 2017).

In its second phase, the program was expanded and positioned as the country's first program on energy poverty. The partners intended to replicate the program throughout the country and incorporate findings into national energy policy. 'EBP and its partners envision transforming this initiative into a long-term nationwide intervention,' the country's first 'living lab' focused on social and technical innovations on energy inclusion (EBP, 2019). The new study with 70 new households (see Figure 5.2) expanded the assessment beyond cost to broader questions of inclusion in energy access, and brought on additional partners. Key partners included the consulting firm EBP, led by a former leader of the Energy ministry; the renewable energy organization EGEA; the Energy Poverty Network housed at the Universidad de Chile; the ministries of Energy, Environment, Housing and Urbanism, and Social Development (EBP, 2019). Anahí Urquiza of the Energy Poverty Network articulated Renca's effort as an important step toward 'programs that address energy poverty at a national level without losing sight of the local scale.' Mayor Castro and others noted that while the program transitioned households toward more efficient technologies, the greater innovation within the national context was the reduction of the financial burden of energy costs and redirection of limited resources to other household needs to combat poverty (EBP, 2017). The second phase of the program intended to work closely with another comuna to facilitate a replication there, and Renca's program would inform a manual for comunas across the country to pursue inclusive energy systems (EBP, 2019). The work undertaken here to redefine energy priorities grounded in the realities of a sacrifice zone contrasts with the more incremental national agenda for regionalizing energy governance, and reveals Renca's positioning within the *dispositif* as representative of a more transformative approach to address broader challenges of poverty and inequality.

Figure 5.2: Renca's program to establish a localized understanding of energy poverty

Source: (EBP, 2019)

5.2 Development of local energy strategies

Parallel to the emergence of the regionalization agenda, the central state introduced a separate effort that supported *comunas* to develop local energy strategies. The *Comuna Energética* (Energetic Comuna) program was adapted from the Swiss 'Energiestadt' program, a counterpart of the European Energy Award where municipalities earn the label of being an 'energy city' when they pursue sustainable local energy policies (Energiestadt, 2024). This section outlines how the state introduced a national program to develop local energy strategies. It then details how Renca developed a local energy strategy articulating an alternate vision for how local governments could lead on sustainability and innovation, conflicting with the central state's top-down approach to energy decision making.

5.2.1 Importing local energy planning

The Chilean version of this model began in January 2014 when EBP Chile and Chile Foundation worked with one of Santiago's most affluent *comunas*, Vitacura, to publish Latin America's first Local Energy Strategy (Estrategia Energética Local or EEL), partnering with the Energy ministry and with financing from the country's economic development agency CORFO (Municipio de Vitacura, 2014). Later that year, a member of the Swiss Energiestadt team was invited to Chile to introduce the Swiss model to mayors in the Chilean Association of Municipalities, with the involvement of the Swiss Embassy, the Chile-Switzerland chamber of commerce, Chile Foundation, and EBP Chile (La Segunda, 2014).

In 2015, the *Comuna Energética* program was launched as an official initiative of the Energy ministry during the second Bachelet administration. Given its role bringing the model from Switzerland to Chile, the consulting firm EBP Chile was initially contracted alongside Fundacion Chile to develop EELs in southern cities known for air pollution, partnering with the Ministry of Environment and the Ministry of Housing and Urbanism, Chilean municipal associations, the Swiss Embassy, and other national organizations consulted in the *Energía 2050* process (EBP, 2023). The *Comuna Energética* program organizes competitions for municipalities to win state funding to develop an EEL or to implement a key action from an existing strategy. Developing an EEL is intended to produce 'greater cohesion between different actors in the *comuna*,' between state and private actors and *comuna* residents, alongside partial decentralization of the energy system (Ministerio de Energía, 2016b: 13). The Energy ministry described these local strategies as 'the first step to achieving a new energy development model for Chile' (Ministerio de Energía, 2016b: 8). Following from the *Energía 2050* participatory process (Ministerio de Energía, 2016b), *Comuna Energética* is intended to include active community participation in energy planning, and the process for developing EELs emphasizes soliciting input from municipal residents, companies, and other actors operating in the *comuna*.

Implementation of EELs, however, is not straightforward for many comunas. *Comunas* with EELs, close to 100 to date (Agencia de Sostenibilidad Energetica, 2024), are considered by the *Comuna Energética* program to have developed the initial institutional framework and capacity to pursue energy initiatives. While at the start of the program a limited number of municipalities had a staff person working on environmental or energy issues, *comunas* that develop EELs are required to assign a staff person as energy focal point, which has enhanced municipal capacity to work on energy issues. The *Comuna Energética* program has facilitated the financing and implementation of a subset of municipal energy projects in the EELs, from solar roofs to energy efficiency measures for a public pool and a hotel (Comuna Energética, 2024b). But many *comunas* face an uphill battle in implementing their EELs, largely due to a lack of staff that have the time or skill to pursue funding, or inability to direct financial resources to energy issues over other basic needs that are administered by municipalities including health, education, and transport. The more affluent Chilean municipalities are usually the ones with multiple staff in place to work on environmental and energy issues.

Responding to the challenge of financing local energy projects, *Comuna Energética* has also been envisioned as a way to channel private sector investment to the local scale. Other country's models of local energy planning allow for public ownership of wind turbines and other infrastructure, a phenomenon more prevalent in Europe. But comunas are not permitted under the constitution to borrow capital, engage in economic activities or generate profit, or set up public utilities. Plus the centralized system of state financing puts most municipalities at a steep fiscal disadvantage, and thus they are more dependent on private investment. Under the second Piñera administration that began in March 2018, the *Comuna Energética* program was moved to the Sustainable Energy Agency, the newly formed quasi-private arm of the Energy ministry, and its funding from the state was reduced significantly. Municipalities were left to rely, to an even greater extent, on voluntary investments from private companies operating in their

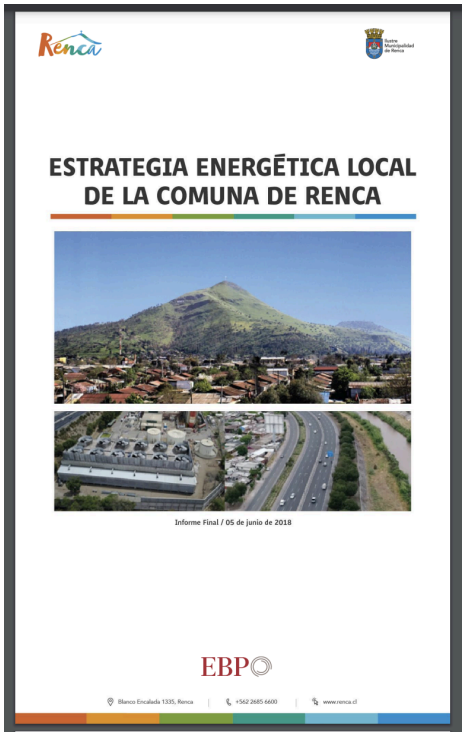
territories. During 2021-2023, funding from the Sustainable Energy Agency to implement projects nationally under EEL totalled around USD $250,000, which was supplemented with leveraged private financing at a level close to matching that amount (Comuna Energética, 2024a).

5.2.2 Renca establishes a local energy strategy

In response to the new national opportunity to establish local energy strategies, the comuna of Renca positioned itself to finance local energy infrastructure through private investment. In early 2017, Renca applied to the *Comuna Energética* program to develop the *comuna*'s EEL, but narrowly lost out on being awarded funding from the Energy ministry. Renca proceeded anyway, securing the support of EBP to facilitate the process. Renca also secured funding from the then-owner of the power plant, AES Gener, making it the first *comuna* to develop its EEL through private investment. Transcending the limited capacity of most municipalities to address energy issues, Mayor's Castro administration brought in a unique team of highly trained professionals to work at the comuna of Renca, for example an Environment director who previously headed up divisions within national ministries. Like other EELs, Renca's strategy establishes and communicates the energy priorities of the comuna and its local partners and residents, separate from energy planning and infrastructure development happening at the national scale.

The resulting EEL developed by Renca (see Figure 5.3) proposed an alternate vision of the *comuna's* role in the country's energy systems, as a site of sustainability and innovation rather than being associated only as a site and source of air pollution. Among the strategic actions in Renca's EEL are a district energy system, a program to address energy poverty, reforestation of Renca Hill, and other activities under the vision of making Renca the 'green lung' of Santiago (EBP, 2018a: 29) (see Figure 5.4). The energy diagnostic for Renca's EEL revealed that companies in the *comuna's* industrial zones contributed to around 80 percent of the *comuna's* energy consumption (EBP, 2018a), which is almost entirely concentrated in 13 companies (Tractebel-Engie, 2018). Thus from the municipality's perspective, the implementation of Renca's EEL or any effort to change energy usage depended heavily on the engagement of these companies.

Figure 5.3: Renca's local energy strategy under the Comuna Energetica program



Source: (EBP, 2018a)

Figure 5.4: Tree planting ceremony to transform Renca's deforested hill into the green lung of Santiago

Source: (El Mostrador, 2019)

While a local energy strategy allows a municipality to articulate its own vision, the positioning of Renca's EEL within the capital region's energy plan demonstrates its limits. The energy plan of the Santiago Metropolitan Region sets forth regional energy guidelines that to some extent draw

from regional potential and priorities. However, the plan simultaneously emphasizes that the intent is for national energy policy to be implemented in regions (Gobierno Regional Metropolitano, 2018b; Ministerio de Energia, 2019a). The regional plan articulates the need to change the way that infrastructure projects are linked to regions and to increase smaller-scale generation projects 'that favor higher levels of energy autonomy.' But the plan simultaneously admits that autonomy will be uneven across the region, given that richer *comunas* in the Metropolitan Region, such as Vitacura and Las Condes, will be able to invest directly in distributed generation, while poorer *comunas* (such as Renca) will need to compete for central state funds. Energy ministry initiatives that organize planning or offer funding for municipalities to pursue local projects on energy or environmental themes, such as the *Comuna Energética* program, are characterized as voluntary programs (Agencia Chilena de Eficiencia Energética, 2023). The development of an EEL is an avenue that *comunas* can choose to pursue or not, rather than an integrated component of the region's energy agenda. Thus regional planning in Chile essentially perceives local efforts as optional, and EELs like Renca's appear to be disconnected from the broader energy agenda that continues to prioritize centralized decision making. The unusually elevated professional capacity that Renca developed has supported devising strategies and establishing partnerships with key partner organizations, but this doesn't address the differences between the regional or national plans and Renca's vision.

5.3 Building local electricity generation infrastructure

A third important thread in Chile's pursuit of subnational energy planning is the exploration of urban district energy pilots. In 2016, the World Health Organization named one of Chile's cities, Coyhaique, the most polluted city in all of the Americas (Bartlett, 2019). After a series of studies on district energy during 2010-2015, the Consultative Committee for *Energía 2050* recommended pursuing district heating as a solution to air pollution from firewood used for heating in southern cities. This was soon followed by the Environment ministry under the Bachelet administration collaborating with the United Nations Environment Programme (UNEP) and other partners to establish the country's first district energy strategy in 2017 (UNEP, 2017). This section provides an account of the central state's efforts in collaboration with international investors and organizations to build a market for district energy infrastructure in Chile. The section then delves into Renca's attempt to position itself as a prime location for a district energy pilot, while advocating for a transformation of the local power plant from polluter to provider of energy services to the comuna, a vision that did not meet the financial requirements of the central state or investors.

5.3.1 The transnational development of district energy in Chile

International organizations and financiers, partnering with the central state, have played a dominant role in catalyzing Chile's pursuit of district energy infrastructure. Launched in 2014,

UNEP's District Energy in Cities initiative is one of six accelerators of the Energy Efficiency Accelerator Platform of Sustainable Energy for All, an international organization originally chartered under the United Nations to drive implementation of Sustainable Development Goal 7 on energy access (UNEP, 2014). The initiative seeks to 'support market transformation efforts to shift the heating and cooling sector to energy efficient and renewable energy solutions.' Drawing on a study showing that district energy systems catalyze integration of renewable energy in cities (UNEP, 2015: 89), the initiative has supported municipalities in geographical clusters, in order to spatially concentrate these systems in a way that could seed large-scale expansion. The initiative prioritized cities that have established plans to combat air pollution, thus selecting Chile, China, India, and Serbia as the original pilot countries.

International investment has been a core prerequisite for getting these projects off the ground in Chile. Establishing the country's first modern district energy system would prove to investors that there was a market for distributed energy systems in Chile, paving the way for additional investments. While district energy systems in Europe can be owned by municipalities, in Chile financing is currently only viable via investment by multinational companies, such as European market leader Engie. Since Chilean municipalities are not permitted to engage in economic activities or generate profit under the current constitution, the centralized system of state financing puts most municipalities at a steep fiscal disadvantage. Building a market for district energy in Chile was also expected to require regional governments to provide a package of guarantees to attract investors, for example exempting *comunas* from paying land use fees. The UNEP initiative arrived with significant potential financial prowess to navigate the investment opportunities and obstacles, including financing from Denmark's development cooperation agency DANIDA, the Global Environment Facility, Italy's Environment ministry, Kigali Cooling Efficiency Program, as well as 19 companies and major international organizations among its partners.

UNEP's involvement in Chile, backed by these financial partners, developed a considerable institutional architecture to support district energy pilots. At the outset of Chile's collaboration with the UNEP initiative, UNEP installed a National Technical Coordinator, the Energy and Environment ministries received UNEP support to develop incentive schemes and a regulatory framework for district energy systems and the Energy ministry established a National Committee on District Energy (UNEP, 2023). Technical support was provided to a small number of Chilean municipalities for feasibility studies, with co-financing from the Chilean central government and Engie, and input from UNEP's Copenhagen Centre on Energy Efficiency. At the start of the second Piñera administration, district energy was included in the new Energy Roadmap 2018-2022 (*Ruta Energetica*), a ministerial unit on district energy and geothermal was established (Ministerio de Energia, 2018), and the Environment ministry included district energy in city-level Atmospheric Decontamination Plans (EBP, 2018b). In 2020, under the latest phase of grant support from the Global Environment Facility for the UNEP initiative in Chile, the Sustainable Energy Agency established a National Office on District Energy to prepare municipal feasibility studies for tender. While 10-12 municipalities were considered for financing, only a few would be selected to receive private investment alongside a small amount of capital expenditure for building funded by the GEF grant (UNEP, 2023).

5.3.2 Renca's district energy pilot

Engaging with another national initiative on subnational energy planning, the comuna of Renca worked to reframe and situate the *comuna* as a prime site for a district energy pilot. In February 2017, within months of Mayor Castro's administration taking office, Temuco and Renca were announced as the first of ten Chilean pilot cities of the UNEP District Energy in Cities Initiative. Temuco was already identified as a 'deep dive' pilot in that it would receive enhanced support, due to being a southern city that had considered a district energy system for some time. Renca's participation was supported by the city of Bern, Switzerland via a city-to-city agreement. Given the lack of any modern district energy systems in Chile, UNEP characterized these pilot cities as 'pioneer' municipalities.

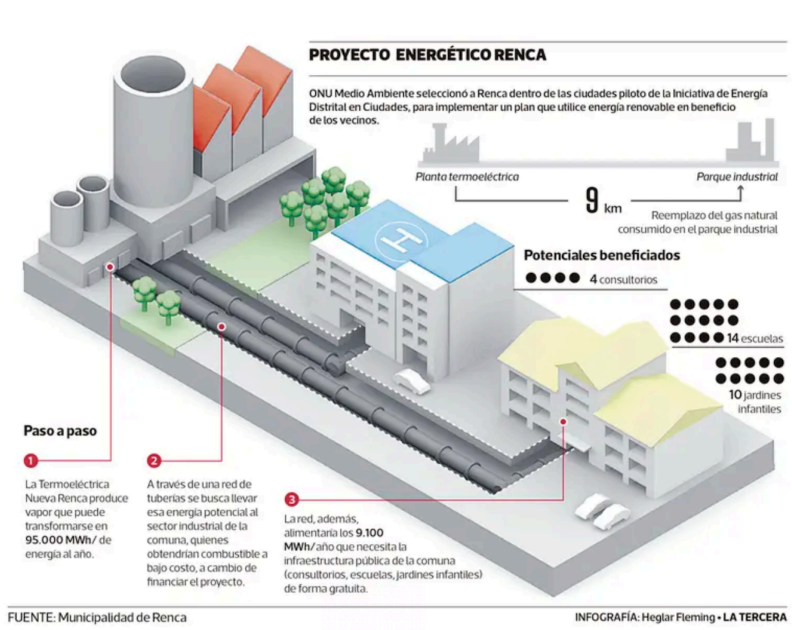
The inclusion of Renca in the UNEP-backed district energy initiative represented an opportunity to address air pollution and energy poverty in the capital. While Temuco was an obvious choice as one of the Southern cities with severe air pollution that initially spurred Chile's pursuit of district energy, Renca was of interest to UNEP as the site of the city's power plant (EBP, 2018b). The other municipalities chosen as pilots in the Metropolitan Region (Santiago, Recoleta, and Independencia) were not as resource-deprived as Renca, and Renca was chosen over wealthy municipalities in the capital city that had already self-funded various energy initiatives. In regional workshops leading to the Energy Roadmap 2018-2022, district energy was only prioritized in the Southern regions that included the highly polluted cities of Temuco and Coyhaique (Ministerio de Energia, 2018). While Renca is not situated the south, it is unique in holding at least three of the criteria that the Energy ministry and UNEP prioritized: residual heat from an industrial source, large companies that could be anchor clients and purchase the heating or cooling produced, and commitment of the local authority (EBP, 2018b).

Renca's pursuit of a district energy system is tied to the comuna's initiative to transform the way that companies in Renca's industrial zones engage on projects. In an effort to generate increased and more coordinated investment in Renca's development, the municipality launched Renca 2030, which aims to change the *comuna* from poor to middle class in ten years. Mayor Castro had been making waves in public presentations with his contention that contributing to economic development can no longer be left to a company's voluntary goodwill, but incorporated as central to company activities in the *comunas* where they operate (Castro, 2020). Under a previous model, the municipality would sign a voluntary contract with one of the 150 large companies in Renca around a specific project, for example the installation of community bottle recycling containers sponsored by Coca Cola or a jobs training program sponsored by Finning/CAT. Like other companies, power plant owner EDF/AME provided funds for individual projects, such as the revitalization of an urban park, and chose to pay their commercial tax in Renca as an important baseline of their relationship with the municipality. Under Renca 2030, resources would instead be pooled from a variety of companies with operations in Renca to pursue service improvements that simultaneously serve the needs of residents and respond to company complaints, such as security and waste management. This

redesign of the model of corporate engagement is also visible in Renca's municipal corporation, *La Fábrica* (The Factory). A common Chilean work-around that allows municipalities to channel private finance, Renca's municipal corporation emphasizes the pooled capacity of private sector partners to engage with Renca's challenges. Mayor Castro describes *La Fábrica* as seeking to 'transform and consolidate a new model of economic, social and urban development in Renca that improves indicators of territorial well-being, through innovation and collaboration between the community, companies, academia and NGOs in a long-term agreement' (Municipalidad de Renca, 2024).

Against the backdrop of Renca 2030, and in an effort to integrate the power plant deeper into these corporate partnerships, the comuna brought together key potential partners around the idea of a district energy plant. At the outset of the Chilean pilot, the comuna organized meetings between UNEP and some of Renca's largest industrial companies. At this point the power plant owner EDF/AME, the Coca-Cola bottling plant, and Latin American bottling company CCU expressed interest in the potential of reducing industrial energy expenditures through district energy connections in Renca. An initial idea was that residual heat from the power plant could be turned into combined heat and power (CHP) in order to fuel manufacturing processes at bottling plants, and possibly produce energy for other companies in the industrial zones. A joint publication of UNEP and Sustainable Energy for All featuring the Renca pilot reported, 'the possibilities are endless' and 'potential linkages between residential buildings, hospitals, schools are all being explored' (UNEP, 2018: 4). See Figure 5.5 for a schematic of the envisioned district energy pilot in Renca.

Figure 5.5: Schematic of Renca's envisioned district energy plant



Source: (Vidal, 2018)

Following the initial broad interest in exploring Renca as a district energy pilot, signs emerged that including the power plant would make the project too expensive to land an investor. While the power plant owners were concerned about the mismatch between supply and demand, they were initially open to exploring the installation of a small boiler that was needed to produce continual heat when the power plant was not operating. For an antiquated and inefficient plant like the one in Renca, selling residual heat could be profitable, but ensuring adequate supply to the district energy system would require adapting operations, and convincing the plant ownership to make these changes would not be easy. Feasibility studies commissioned by the comuna and UNEP, and separately by EDF/AME, showed that using residual heat would increase the costs to potential end clients, making it more difficult to attract investment. First, using residual heat as the energy source was found to require the highest up-front construction costs when removing the cost of land, alongside other options of electric chillers, heat pumps, and gas boilers. And second, the length of pipeline needed to channel residual heat to other locations in the *comuna* would significantly increase the cost of the project. End users of the system needed to be near the power plant and consuming a high amount of energy, and there weren't enough of these large anchor clients to make the project financially viable. In a 2018 feasibility study, financial viability rested on securing state incentives or integrating the project into future development initiatives, such as the slated expansion of the Santiago metro to Renca (Tractebel-Engie, 2018).

Despite these obstacles, the comuna initially endeavored to maintain its vision and pressed for residual heat from the power plant to be retained as an option. The project was the comuna's flagship energy initiative, and the power plant's involvement would bolster the comuna's vision of private sector collaboration through Renca 2030. Securing involvement of the power plant would also symbolize transformation of the country's centralized and polluting generation plants,

from creating sacrifice zones to contributing to localized energy solutions. UNEP supported Renca's vision, articulating that district energy could become the plant's core business in the future, phasing out of its current incarnation generating electricity from natural gas and diesel. But due to a lack of investability, the comuna was eventually forced to drop the idea of involving the power plant in a pilot, while remaining interested in additional competitions for private investment organized by UNEP and the Sustainable Energy Agency and funded by the GEF. Renca also explored alternative financing options, including a partnership with the Japanese city of Fukuyama, using a Joint Crediting Mechanism under the UNFCCC that would split offset compensations between Japan and Chile. However, the power wielded by the international and national decision makers in the UNEP initiative has so far left Renca's vision unfulfilled.

5.4 Evidence of the dynamics of a dispositif

Drawing on the above accounts of Renca's engagement with three Chilean regionalization agendas, this section uses the lens of *dispositif* to examine the comuna's capacity to pursue its localized version of these agendas. The presence of three dynamics is explored: the coherence of diverse elements that generates capacity to govern this subnational energy agenda (McGuirk and Dowling, 2020); the exercising of *power over* the comuna, setting it apart from assemblage; and the extent to which this is a settled power.

5.4.1 Coherence of diverse actors around local energy agendas

Looking to the first dynamic, the existence of a *dispositif* can be seen in the coherence of diverse actors that are assembled around Renca's localized energy agendas. A broad range of actors have supported Renca's effort to articulate alternative priorities for energy governance. Energy poverty studies brought together domestic non-governmental actors such as EBP and Energy Poverty Network, the central state via ministries, and the Swiss government through its Chilean embassy. These actors were bound together by a shared purpose of identifying and elevating the aspects of energy poverty that had been less visible in national discourse. The development of Renca's EEL brought the comuna into relationship with the *Comuna Energética* program of the central state, consulting firm EBP as technical advisor, and power plant owner AES Gener as financier. And in Renca's pursuit of a district energy pilot, the actors engaged included the power plant and other industrial companies, the central state through the Energy ministry and Sustainable Energy Agency, and international partners via the UNEP District Energy initiative, including governments, intergovernmental bodies such as GEF, and private sector. The engagement of these diverse actors circling Renca contributed to the comuna's enhanced capacity to pursue these agendas.

The district energy pilot provides an example of the framing mechanism that served to bind key actors together. When Renca joined the national initiative as a pilot, a diverse set of stakeholders assembled around Renca that could deliver the pooled capacity to explore the feasibility of a district energy system. These organizations were assembled and brought into a

closer relationship through feasibility studies, which were used to frame potentiality and assess comunas as possible pilots. The studies conducted the political work of shaping comunas into sites of intervention and legitimising private investment as the sole avenue for realizing these systems (McGuirk and Dowling, 2020; Stripple and Bulkeley, 2019). A rapid assessment of five municipalities including Renca, commissioned by UNEP and the GEF, evaluated each municipality against key criteria in search of 'optimum demonstration projects' that would 'set economic expectations for investors' in the new Chilean market.

While the framing provided by feasibility studies brought multiple actors into conversation around Renca's investability, it also allowed Renca to directly articulate a distinct vision of the project to this audience. The report pointed to highly polluted residential areas as an important aspect of the selection process, noting that setting a precedent of choosing sites solely based on investability and high energy demand alone would fail to address potential social benefits (Tractebel-Engie, 2018). The juxtaposition of securing investability while also addressing key sites of air pollution framed the problem in a way that made a place like Renca more visible as a potential site and enrolled relevant partners around that potential. Securing a district energy pilot would validate Renca's vision of the comuna as an innovator and pioneer, catalyze decentralization of the country's energy systems, and establish a new relationship with the power plant based on mutual benefit. In line with Renca 2030, the municipality was motivated to demonstrate that the municipality could partner on a more even footing with companies in the country's largest industrial zone, particularly the power plant given its symbolic entanglement in Renca's history and identity.

5.4.2 Power over comunas

The second dynamic of a *dispositif* under examination highlights the differential *power over* comunas that domestic and international actors exercise. Comunas are the site of local energy agendas, but more powerful actors beyond their jurisdiction serve as a sort of nucleus of the *dispositif*, where final decisions determining the fate of these local energy agendas take place. While Renca was supported by the central state, the power plant, and a domestic consulting company to develop an EEL, the potential of comunas to implement these plans is weakened by the voluntary structure of the plans and the fact that the central state's regional energy plans take precedence. The Energy ministry's ultimate power within the *dispositif* is materialized in the mandates of SEREMIs, which implement the central state's aims rather than elevating priorities of EELs.

Renca's experience with pursuing a district energy pilot also reveals this dynamic of *power over* municipalities, in that the central state and international actors determined whether Renca could finance its particular vision. While the comuna participated as the potential site of and advocate for the district energy system, UNEP and the Energy ministry held the reins of the national process and considered Renca as only one site of multiple potential options. In line with its environmental mission, UNEP chose Renca as a pilot due to the agency's preference for siting district energy systems where fossil fuel sourced supply can be harnessed and redirected. The

Energy ministry, and to a lesser extent the Environment ministry and Housing and Urbanism ministry, are UNEP's primary Chilean partners in the district energy initiative. Together they decide which Chilean municipalities receive support to pursue district energy systems, which is influenced by the financing partners of the District Energy in Cities Initiative. Renca received support through the contracting of engineering company Tractebel, a subsidiary of potential investor Engie, to evaluate the feasibility of a district energy system. In UNEP's review of initial studies, Renca's potential was diminished when the project design included a pipeline that was too long and costly, there were not enough anchor clients, and residents experiencing energy poverty would not be served. Tractabel found the comuna's insistence on the use of residual heat from the power plant to be problematic, because it didn't deliver the level of profitability that its parent company Engie and other investors were looking to establish in the Chilean market. The shifting of attention away from Renca demonstrates the extent of *power over* Renca within the *dispositif.*

Renca's industrial partners, particularly the power plant, also exhibit considerable *power over* the comuna and its vision. The determination that it was not feasible to include the power plant as residual heat source or other industrial companies as end users contrasted with the Renca 2030 initiative and Renca's EEL, both of which center industrial engagement. At the outset of the Renca pilot, discussions commenced with local representatives of AME/EDF to make the power plant's residual heat the energy source of the district energy system, and bottling companies Coca-Cola and CCU as potential end users. These companies want to be perceived as 'good neighbors' in Chile, and already participate in the municipality's other initiatives for this purpose, but that intention was not enough to cement a deeper partnership around the pilot. While the power plant owners could generate considerable revenue through selling residual heat, their remit is to maintain the financial viability of an antiquated fossil fuel plant. That task has become increasingly challenging over time, due to the country's expanding emissions reductions requirements as well as a 2019 pledge by the Energy ministry to close four of the country's coal plants owned by the same company (Martín, 2019). Becoming part of Renca's district energy system would mean that plant operations staff would need to convince the owners to change their business model, and embark on an administratively challenging endeavor. The bottling plants could reduce energy costs by purchasing the residual heat, but it was determined that they are too far away from the plant to be end users.

In the end, potential investors in the country's district energy pilots, as gatekeepers of financing, determine where and how the pilots will be constructed. Multinational investors were looking to establish the precedent of a profit margin that could be replicated for long-term gain, an approach supported by the central state and UNEP. Financialization is an aspect of cohering that is characteristic of *dispositif* (McGuirk and Dowling, 2020). The feasibility of a comuna's envisioned district energy system is reduced to delivering on this profit margin, thus confirming the central state's model for bringing these distributed energy systems into being.

5.4.3 Settled power

The third dynamic under examination is an arrangement that is more settled and ordered (Fredriksen, 2015). The power dynamics of the *dispositif* analyzed here seem to be settled in that they are an extension of the historic centralization of the country's governance and energy systems. This hints at the characteristic 'resultant formation' of a *dispositif* that is more fixed than the sense of 'emergence' attributed to the broader concept of assemblage (Fredriksen, 2015: 12). Settled power implies ultimate control, or the ability to end all disputes or uncertainty. The realization of Renca's alternate visions to center energy poverty, to reinvent itself as a site of innovation, and to enroll industrial partners is held back by actors who wield this type of settled power. The Energy ministry would need to revamp its approach to energy access if it were to respond to the energy poverty realities of Renca's studies. It would also need to integrate regional and subnational planning, and enhance authority at the subnational scale, to support implementation of Renca's EEL. And to support Renca's aim of incorporating the power plant into the district energy pilot, the Energy ministry, UNEP, and international investors might need to more strongly prioritize tackling air pollution over investability in their selection of sites.

This ultimate control over the implementation of Renca's visions is evidenced by the fact that the *dispositif* around the district energy pilot departed from Renca as quickly as it had entered. While UNEP and the Energy ministry framed the arena of intervention (Li, 2007; Stripple and Bulkeley, 2019) as prioritizing external private investment, Renca's attempts to instead prioritize residual heat from the power plant were not successful. Compared to other sites in Chile, Renca's project was not oriented in a way that would land an investor, and so UNEP, the Energy ministry, and Tractabel-Engie shifted their focus elsewhere. At one moment, the *dispositif* was focused on Renca, and in the next, it shifted to a new location that could fulfill the framing of its mission.

The settledness of the *dispositif* relies on comunas remaining in a dependent position, rather than developing the capacity to realize their own agendas. Through its contribution to feasibility studies, Renca garnered a deeper understanding of the circumstances in which industrial companies might engage with comunas, but also the limits of their participation. Additionally, the challenge of competing for central state financing for a district energy system contrasted with the success Renca has found securing financing by partnering with other countries. Renca's partnership with the Swiss government on various initiatives, particularly energy poverty, and an exploration of partnering with the Japanese government on district energy, provides the comuna with an advantageous capacity to circumvent some of the dependencies on the central state that other comunas face. And it is conceivable that the expansion of municipal capacity through the establishment of these various subnational efforts may evolve the power dynamics between comunas and the Energy ministry over time.

5.5 The relevance of dispositif and implications for Chile's energy transition

This chapter explored the project's third research question, the extent to which subnational actors are able to determine their own energy future. The central state has pursued a variety of efforts to engage the subnational scale in energy planning, through regionalization of energy governance, local energy planning, and distributed electricity generation. Charting developments around Renca's pursuit of these local agendas, the chapter examined evidence of the dynamics of a *dispositif*, including the coherence of diverse elements that generates capacity to govern, the existence of *power over* a comuna, and the extent of settled power.

The lens of *dispositif* is helpful in pinpointing the dispersed and multi-scalar forms of power that influence a comuna's ability to bring its energy plans to fruition. Renca's case reveals how the central state, international organizations, and private investors wield control over the realization of local energy agendas. A *dispositif* assembling these actors around Renca delivered a collective capacity to both explore potential and deliver final decisions. Energy poverty studies, local energy strategies, and district energy feasibility studies served to cohere diverse actors around potential energy futures and shape the arena of intervention. While Renca was elevated in its ability to articulate and advocate for its distinct vision of the project, the Energy ministry and UNEP, backed by potential investors, represent a sort of nucleus of the *dispositif*. In the case of the district energy pilot, this nucleus of actors jointly wielded power by prioritizing investability and dismissing Renca's insistence on the inclusion of industrial partners that the comuna views as critical to its future development. At the outset these actors favored Renca as a potential district energy pilot, but once the framing of investability could not be fulfilled in Renca they moved on to other comunas. The decision to set Renca aside as a pilot was framed around key criteria, and while tackling air pollution is among these criteria, the cost of a project involving the power plant was the deciding factor against Renca's candidacy. In this way the *dispositif* became a container for the juxtaposition of investability versus addressing local priorities to address air pollution, energy poverty, and related historical injustices.

Learnings from this examination of a comuna's pursuit of local energy agendas confirms the importance of multi-scalar and relational examinations of urban energy transitions. Renca's case demonstrates how investors at the regional scale dictate decision making at the national and local scale. Renca is an example of a city in an emerging economy that global investors seek to reformat and decode for investment (Bigger and Webber, 2020; Hilbrandt and Grafe, 2022), and one that is at high risk of continued disenfranchisement (Hilbrandt and Grafe, 2023). This case offers further weight to the argument that urban energy transitions do not proceed along an established linear trajectory or through fixed alliances and capacities. Rather than being steered centrally by a static state, multiple scales and power relationships are involved in energy transitions, requiring attention to relational configurations and the dispersed nature of state power (Bulkeley and Schroeder, 2012; McGuirk and Dowling, 2020).

Renca's case illuminates the considerable challenges that comunas face in implementing locally determined energy pathways. Comunas like Renca are engaged alongside a heterogeneous group of actors that amount to a ‘‘tangle' of modalities of power' (McGuirk and Dowling, 2020: 23). This tangle of actors may allow municipalities to earn an audience for their visions, but the nucleus of power that represents the interests of financial actors is potent and holds

considerable sway. McGuirk and Dowling (2020: 24) argue that ‘attending more closely to the malleability, plurality and failures of composing and cohering governance capacity across a distributed *dispositif* will enhance recognition of the potential of urban governance as a heterogenous space of political possibility, less easily tethered to dominant agendas, interests or aspirations than has previously been imagined.’ The novel contribution of examining Renca’s story through the lens of *dispositif* is that despite being uniquely entrepreneurial in its endeavors and with greater capacity than most, under-resourced municipalities enjoy less of this political possibility.

The concept of *dispositif* usefully highlights the potential of actors changing capacity (McGuirk and Dowling, 2020), shifting their positioning in relation to other actors and potentially gaining greater ownership of and authority over local agendas. Renca’s attempts to enroll the power plant and industries into a district energy pilot may have not come to fruition to date, but the municipality’s capacity to navigate the energy space has been elevated over time, evidenced by the continued development of heavyweight alliances with actors well beyond its jurisdiction. In the absence of an energy agenda that integrates the regional and local scales into planning and implementation, a tremendous amount of responsibility and capacity is required of municipalities. Instead of a state-financed infrastructure, the pilot district energy systems in Chile are conceived as a for-profit concession model, requiring municipalities to navigate the complexity of a new pricing model and to establish municipal corporations to facilitate private investment. Financing the introduction of a major new technology for the country puts the onus on municipalities to configure the necessary institutional allies and a financial scheme that will attract an international investor.

These dynamics of Renca’s positioning have implications for the incorporation of locally derived visions into Chile’s broader energy pathway. The Energy ministry’s introduction of regionalization priorities, the *Comuna Energética pro*gram, and the district energy initiative during the Bachelet administration shifted some attention to the subnational energy agenda and initiated a process of municipalities building capacity and planning to address energy issues for the first time. But this agenda was constrained by opposing factors from the outset. Prioritization of regional interests in energy policy remained one of the more controversial topics in the development of *Energía 2050*, and the plan’s original goals have only been partially fulfilled in implementation. Elevating regional governance requires a slew of new regional and municipal instruments and there was little clarity in the *Energía 2050* development process on how centralized planning would take these into account (Alvial-Palavicino and Opazo-Bunster, 2018). The second Piñera administration then began to erode any burgeoning national coordination with subnational bodies by halting the development of additional Regional Energy Plans and curtailing state funding for SEREMIs and the *Comuna Energética* program. These restrictions on municipal authority were in focus during the national revolt of 2019, when comunas called for an end to fiscal inequities that cripple their ability to respond to a variety of local aspects of poverty, including the high cost of privatized energy services. Mayor Castro, in his capacity representing the Chilean Association of Municipalities, denounced the reality that ‘the State builds a city depending on who inhabits it and how many resources they have’ (Hormaechea, 2020) while residents of poor *comunas* like Renca must rely on the central state for support

rather than their own municipality (Castro, 2020). Renca is thus in focus as a potential site of energy transition, but at the mercy of the central state and its international partners to manifest its own vision.

This chapter and the previous two chapters identified the dynamics at multiple scales involved in the construction of energy markets, examining how global financial actors and the central state discursively construct energy markets, while the local state's capacity to govern is determined by a coherence of actors brought together in a *dispositif* across these scales. The concluding chapter that follows draws on these empirical findings and returns to the conceptual framework, highlighting key contributions and situating the project within the broader literature and policy landscape.

6. Conceptual and policy implications of a divided energy transition

The aim of this thesis is to investigate how markets are being made for energy transition in the Global South. By examining the movement of financial capital into the renewable energy industry, the reshaping of the state and alternative pathways at the local level, the thesis advances existing lines of inquiry in this arena while also providing an account of the types of key dimensions that emerge at each scale and across scales. Offering a combined methodological and conceptual approach, the thesis argues that adopting a multi-scalar approach facilitates a more authentic understanding of energy transitions in the Global South.

Drawing on the literature review as well as historical geography of Chile, the conceptual framework of this thesis is designed to investigate how markets are being made for energy transition and to demonstrate the limitations of examining these processes at a singular scale. The first component of the conceptual framework draws on political economy and the role of the state, facilitating a focus on both agency and structural parameters and understanding of the dispersed and multi-scalar state and its ever-evolving interwoven relationship with financial actors. The second component encompasses the power of global financial actors to create investment directions in the Global South and efforts to remove blockages to the circulation of capital, resulting in upward trends of financialization. One of the central modes by which financial actors express power is through discourses and calculative devices that aid in construction of energy markets, thus the third component of the conceptual framework incorporates cultural economy approaches. Finally, urban climate finance in the fourth component of the conceptual framework brings into view the interconnectedness of social relations and capital flows in the transformation of cities to capture global finance, which has been described as a reformatting of cities to facilitate investment. Using these conceptual elements, the thesis examines how financial actors create investment directions in the Global South, the discourses and devices used by financial actors and the national state to make energy markets and attract investment, and reformatting of the subnational state which in this case is subject to a broader *dispositif* constraining local authority.

As context for answering the thesis' research questions, this chapter revisits the conceptual framework introduced in Chapter 1 and then addresses each research question in turn. Section 6.1 reviews how financial actors create investment directions toward Latin American countries, specifically the use of discourse as a method of discipline, the pairing of safety and spectacle, and the transformation of energy systems into investable units. Section 6.2 turns to the role of the national state in making energy markets and attracting investment, pointing to an expanded understanding of incumbency, the central state operating through assemblage and converting energy systems into tradable units, and how financialization advances the state's power. Section 6.3 examines the extent to which subnational actors are able to determine their own energy future, exploring the disciplining effect of central states governing urban energy systems and constraints on the realization of local energy visions. Following the probing of each research question, Section 6.4 offers a discussion across these scales and Section 6.5 then considers the limits of the approach and research undertaken. Section 6.6 points to lessons for policy,

including the need for new modes of energy generation procurement at the national scale that center the socio-economic aspects of energy systems; fiscal decentralization to support under-resourced local governments in the realization of their energy transition vision; and globally, decoupling financialization from energy systems governance. Finally, Section 6.7 provides an overview of potential future research.

6.1 How do financial actors create investment directions in the Global South?

This section examines the first research question in this project, *How do financial actors create investment directions in the Global South?* The second component of the conceptual framework outlined in Section 1.3 of Chapter 1 elevated the reality that financial actors create directions across scales that match their investment interests. This is an important context for understanding market-making because it is a process that is initiated globally rather than locally. Existing scholarship outlines the ways in which global financial structures and actors have become highly influential in national and local processes of energy market-making, and financialization of energy systems has come to dominate the interests of these global actors. Also very relevant framing for this research question is the third component of the conceptual framework that highlighted the ways in which financial actors use discourses and devices to create influential directions. Financial actors use calculation and commensuration of both material and abstract elements to create a narrow framing of investability, selecting elements to include that align with that framing while excluding elements that do not. Drawing on these components of the conceptual framework, this section explores how the discourses of financial actors reward and discipline entire countries; the importance of the discourse of investment safety alongside spectacle; and interpretation of energy systems as uniform and tradable.

Through a novel examination of renewable energy investment in the Latin American region, this thesis shed light on the power of financial actors to sanction investment directions toward countries that behave in ways they require, and to discipline or scold entire countries that do not conform. Literature on discursive efforts to guide investors to locations in the Global South has demonstrated a pattern of presenting a narrow interpretation of energy systems. Renewable energy narratives have been employed to aid in ‘constructing the land as marginal so as to facilitate investment and foreclosing resident’s broader political claims’ (Rignall, 2016: 540). Similarly, classification techniques around wastelands have had the effect of obscuring existing land use patterns (Baka, 2013). These examples demonstrate the ways in which states and financial actors ‘have taken stock of what is contained within their territories; framed and classified those contents into categories such as “natural resources” or “frontier”; and used the resulting knowledge and capacities to further state projects’ (McCarthy and Thatcher, 2019).

The investigation of renewable energy indexes presented here demonstrates another case of the quantification and standardization processes at play, but one that takes this valuation one step further. Indexes portray a narrow set of countries in an investor-friendly light to direct financial flows to those locations, similarly obscuring factors that do not fit the narrative. But while maps and other classifications present a singular spatial representation, indexes compare

the performance of countries as a whole and declare winners and losers. In effect they are a referendum on entire nation states, legitimizing and delegitimizing entire countries as deserving of investment or not, which raises the stakes for those named countries and the state institutions involved in governing them. The winners are liberalized states that have adapted their economic and governance structures to prioritize the interests of external investors. Thus financial actors have the power to direct financial support to states that conduct themselves in an investor-friendly manner. This constitutes an amplification of the process of validation of neoliberal energy transition models (Newell and Phillips, 2016), allowing financial actors to determine the conditions of energy transition (Christophers, 2022).

Literature on disciplinary neoliberalism is also relevant here, understood as a 'politics of supremacy' (Gill, 1995: 400) and 'concrete form of structural and behavioral power' in which capital has the 'ability to promote uniformity and obedience' (Gill, 1995: 411). Financial actors are united in 'a key set of norms and objectives that are shared among donors, multinational companies, private financiers, multi-lateral development banks and state elites' (Bayliss and Fineeds , 2007). Alongside structural and material financial power, financial actors employ this disciplinary unity and capacity through a 'discursive power to legitimise, validate and embed neoliberal models of transition' (Newell and Phillips, 2016: 42). This facilitates existing power relations remaining intact despite the technological transition underway (Newell and Phillips, 2016).

Renewable energy indexes are an embodiment of disciplinary neoliberalism, penalizing governments that fail to perform along the lines of investor interests. While the winners of renewable energy indexes have followed an investor-friendly path, the governments of countries that have not followed this path are relegated to the bottom, a message to investors to avoid those locations. In seeking to avoid certain countries, the disciplinary message encourages investors to concentrate their attention on the winners and ignore most other countries that are among the losers, obscuring any factors beyond investability. The concentration of financing away from non-compliant countries has the effect of making governments more accountable to markets and punishing them when they veer off this course.

Also highlighted in this thesis is the fact that investment opportunities in emerging economies and countries of the Global South often carry a narrative of being both spectacular and safe. Tsing (2000: 118) describes spectacle as a 'regular feature of the search for financial capital.' Devices that deliver a spectacle are 'charged with conjuring the miracle nation in the face of competing, threatening alternative visions that unless warded off might come to control the apparatus of the state' (Tsing, 2000: 140). Li (2014) describes how value is signaled by the potential of resources that are perceived to currently be underutilized. The communication of a 'dramatic shift' is deliberate, as needs related to natural resources 'actually rise steadily not spectacularly, so why the rush?' (Li, 2014: 596). In line with these examples, spectacle was central to the discourse built around Latin America's renewable energy boom, through dramatic messages of the unparalleled size of projects, the unending abundance of resources, the speed of growth in the region, and the amount of profit to be made. But given the troubled history of investment in Latin America, messages of spectacle had to be paired with messages of safety.

Devices that deliver spectacle are also charged with delivering ‘security of profit and property’ (Tsing, 2000: 140). The narrative of security alongside the drama is a key contribution of this research project. Given fears over a new and potentially risk-laden investment location, the safety element of the discourse was delivered through demonstrations of resource potential, the absence of state intervention, comparison to more complicated and crowded industrialized states, and separating emerging markets from other countries in the Global South. Delivered in one package, this dual discourse of spectacle and safety targets key barriers to the circulation of capital, while reinvigorating historical patterns of dependency and financialization.

This effort has also unearthed how financial actors create investment directions for renewable energy investment in the Global South by interpreting energy systems as uniform and tradable. Literature on the discursive underpinnings of financial flows point to markets being created by calculating elements that are to be internalized or externalized (Callon, 1998a), and obscuring elements that are not intended for visibility and could have influence if they were included (McCarthy and Thatcher, 2019). Diverse elements are made the same and turned into tradable units (MacKenzie, 2009).

The thesis introduces a novel example of these types of discourses, indexes of professional services firms that compare the performance of countries in adapting to the needs of investors. Professional services firms design indexes to focus on the narrow factor of investment potential, turning the realities of country energy systems into abstract units that can be ranked. Creation of these abstract units then allows financial actors to prop up countries with ideal investment environments and discipline countries that do not meet investor needs. This process of homogenization assigns value to some elements while obscuring unfavorable factors unfriendly to investors, showing how making things the same advances a false narrative about the reality of energy systems. The same-making facilitated by indexes prioritizes large utility-scale infrastructure, and the types of financing routes that investors prefer and that governments are accustomed to engaging with. This ends up obscuring many other factors that go into developing an energy system, as well as myriad human and environmental costs. This investigation of uniformity in energy investment opportunities facilitated the exploration of a unique discursive device, confirming the utility of a cultural economy lens to understand the direction of financial flows. The power they hold to channel finance in particular directions demonstrates the weight of discourses alongside material elements in the context of energy transition.

6.2 What is the role of the national state in making energy markets and attracting investment?

This section examines the second research question, *What is the role of the national state in making energy markets and attracting investment?* The first component of the conceptual framework on political economy provides framing for this question in pointing to the structural power and agency of the state. Rather than distant entities operating separately, the state often works in concert with financial actors, while at other times asserting state power in ways that are

contradictory to investment interests. This is an important context for understanding the state's contributions to constructing energy markets to align with financial actors. Also relevant from the first component of the conceptual framework is the dispersed nature of the state's power, such that examining the role of the state requires paying attention to its relationships to other entities and its actions that touch multiple scales. The third component of the conceptual framework focused on cultural economy and highlighting the role of devices that have been used to construct markets is also valuable in understanding the state's methods for attracting investment. Drawing on these components of the conceptual framework, this section explores an expanded understanding of incumbency focused on the types of financial models rather than just the technologies employed; how the central state cannot act alone but is embedded in an assemblage of socio-material elements; how the central state converts energy systems into tradable units as a proxy for its power; and how financialization fuels state power.

National states seeking to develop renewable energy infrastructure do not operate independently from global financial interests. Johnstone and Newell make the case for a multidimensional and relational understanding of the state, which has the ability to both enable and obstruct sustainability transformations. Their assessment is that states 'are not monolithic actors abstracted from society, but are rather constituted by broader social power relations that constrain the kinds of state action that are possible in relation to sustainability transitions' (Johnstone and Newell, 2018: 80). Energy pathways are constrained by an 'investor-led, donor-shaped policy context where finance and technology choices are shaped by private and international actors and state elites' (Newell and Phillips, 2016: 47). Even if a government were to articulate a plan for an energy system centered in equity and justice, financing requirements can lead the state and other actors to compromise this intention (van den Bold, 2022).

Evidence from Chile's tender process reveals this state tendency to both enable and obstruct, as described by Johnstone and Newell (2018), and this project offers a concrete example of this complex state role. The Chilean Energy Ministry demonstrates considerable power, through the tender, to shape the types of investment and infrastructure brought into the country, following the intention of the Bachelet administration to recover state control of the generation procurement process from incumbent energy utilities. But the state's approach also confirms its attunement to prioritizing a welcoming environment for investors and a market-centric approach to energy transition. The stripped down tender is certainly a representation of Chile's long history of neoliberalism, but it is also a reflection of a global financial environment that demands a demonstration of low risk investment. Similar to Luke and Huber's (2022: 1707) assessment that it can be 'difficult to define and investigate who exactly has a stake in electricity capital,' the actions of the Chilean state overlap with investors to such an extent that it's challenging to discern where the boundary lies between their aims.

While the state's complex role has been documented as both amassing state control of energy transition processes and simultaneously prioritizing the needs of incumbent energy companies, this project highlights a broadened understanding of incumbency. Existing literature demonstrates the ways in which the state favors a narrow set of dominant financial actors. States use subsidies or contracts to reduce the uncertainty of financial returns and offer a sense

of stability (Christophers, 2022), which favors a narrow group of private sector actors. This has reinvigorated the dominance of incumbent actors and ensured their competitive advantage, resulting in consolidated ownership among fewer and fewer large companies (Baker, 2015). The result is ‘a transition in technology without a transition in existing configurations of structural power (Newell and Phillips, 2016).

Chile’s case highlights the state’s role in favoring incumbents, but it also highlights that it is not only fossil fuel companies that should be understood as incumbents. While some of the companies winning bids for solar and wind projects could also be providing electricity services from fossil fuel sources, the size and power of the companies winning bids remains the same. Large companies investing in wind and solar engage in the same sort of dominance that maintains structural power and negates other aspects of energy transition. This warrants expanding our understanding of incumbency in energy transition to structural incumbency, in that it is not the type of technology that characterizes financial actors as incumbents but the financial models they help sustain and advance. The Chilean case demonstrates the leading role of the state in sustaining structural incumbency by designing energy procurement systems that prioritize the needs of a small number of powerful financial actors. Thus the transformation underway in Chile is limited to a change in the technology being used to generate electricity. The Chilean state may be following the only path it thinks possible, as states do not necessarily have open ended choices (Newell, 2018) and are reliant on private sector investment (Christophers, 2022). But this is a case of a state designing a tender that removes all obstacles so that structural incumbents can succeed. In this way the Energy ministry and bidding companies are working in lock step to achieve a mutually beneficial investment (Newell and Phillips, 2016).

This mutually beneficial pathway shared by central state and financial actors brings visibility to the fact that states do not act in isolation, and the Chilean tender further visibilizes how assemblages are at play in energy transition. Existing literature shows how the state’s power is actualized through assemblages that rely on other actors and scales (Bulkeley, 2015; Callon and Muniesa, 2005), and discursive framings are intricately interwoven with material elements (Bridge et al., 2019; Loconto, 2015). Other transnational actors, such as development donors and banks, may not seem directly involved but are also closely aligned (Power et al., 2016). These alliances, or institutional ensembles (McGuirk, 2004), demonstrate the dispersed nature of governing energy transition, introducing relational over ‘static notions of power’ and revealing ‘the state’s embeddedness in particular social relations’ (Johnstone and Newell, 2018: 73).

The Chilean case reconfirms these analyses, demonstrating an example of how the state cannot act with complete autonomy. While the tender is a device managed by the Energy ministry, its design is dictated by prospective investors whose full engagement is the determinant of success. The assemblage created by the tender is actualized through hard-copy bids performed in front of these actors, an algorithm that carries the intention of the state to prioritize a narrow set of companies, and long-term contracts that bind the state to these companies over decades. In the background of the tender process are private sector and state processes that involve decision making with the local state about infrastructure siting, such as

land use planning and environmental assessments. Given that these myriad actors and material elements are essential to the functioning of the tender, our understanding of energy transition and energy procurement processes cannot be limited to only the two actors - the Energy ministry and the winning bidder - signing a power purchase contract. The reality of energy transition is that the actors and elements that are in relationship are unbounded, as fits a process that is deeply embedded within a global financial system seeking directions for financial flows.

The Chilean case demonstrates how states wield devices to convert the complexity of energy systems into a tradable and uniform measure, allowing the state to appear agnostic while the tender appears to make decisions. States engage in market-making by bringing a new commodity to life that is 'made transferable and tradable' (MacKenzie, 2009: 443) and disguises any heterogeneity. Lines are drawn around what is relevant and irrelevant (Preda, 2006) and these framings serve to detach abstractions from reality (Callon, 1998a; Langley, 2008; MacKenzie, 2009; McCarthy and Thatcher, 2019). Performance aids in assigning power and importance to certain elements over others (Lansing, 2012). Abstraction is prevalent throughout Chile's tender process, in the conversion of heterogeneous elements of an energy generation project into a single bidding price, in the performance of a bidding event that compares tradable elements, and in the use of an algorithm to calculate which proposals should win. All of these abstractions and calculations allow the state to command power by propping up the tender as its proxy. This case thus offers an example of how conversion of energy systems into abstract tradable units helps preserve the power of the central state and its mandates about the direction of energy transition.

This case also demonstrates how the power of the state in advancing energy transition is fueled by its relationship with, and in many ways deference to the financialization requirements of, global financial actors. Recent literature has documented how financial institutions are expanding accumulation frontiers by converting new types of resources into assets (Knuth, 2015), and how infrastructure development is increasingly designed to create value and 'extract monopoly rents' for investors (Knuth, 2018: 226). In the growing assetization of the energy sector, financial value is determined not by an asset's use or exchange value but by whether it can generate returns (Bridge et al., 2019). In fact, the returns that energy produces have become more important than the energy services generated (O'Neill, 2009). The Chilean central state designed and implemented a tender that prioritizes the types of investments that are intended to assetize the country's energy system, exemplified by the rampant on-selling of energy projects soon after winning the tender. While the literature on financialization often focuses on the power of the financial sector, this case offers an analysis of how the state also amasses its power by supporting the financialization goals of global companies.

6.3 To what extent are subnational actors able to determine their own energy future?

This section examines the third research question, To what extent are subnational actors able to determine their own energy future? The fourth component of the conceptual framework

employing the urban climate finance perspective, is most relevant here, showing how cities of the Global South are seen as financial frontiers and global financial actors and the central state engage in reformatting cities toward that purpose. These efforts tend to deepen inequalities, particularly for cities that are already under-resourced. The third component of the conceptual framework elevates the concept of *dispositif*, which helps interrogate the positioning of subnational entities and the coherence of elements and relationships that influence its authority, particularly global financial actors and the central state. Drawing on these components of the conceptual framework, this section explores the disciplining effect of central states governing urban energy systems and the constraints on the realization of local energy visions.

In an environment in which global financial actors are creating investment directions in the Global South, and the central state's use of the tender puts the country in lockstep with these financial actors, subnational entities seeking to implement a distinct and self-determined energy pathway face an uphill battle. The literature on urban climate finance unveils how 'financialization agendas have asserted themselves as the only imaginable pathway to do and undo such futures in effective ways' (Hilbrandt and Grafe, 2022: 896). Global financial actors engage in 'futuring' (Hilbrandt and Grafe, 2022: 897) through the performance of data and metrics oriented toward better decision making, and by articulating an urgent impetus for climate action in which a city 'gains safety by relying on financializable green high-tech solutions' (Hilbrandt and Grafe, 2022: 900). This logic is described as involving a blanket generic understanding of cities, an 'ignorance of local epistemologies,' and built on 'notions of danger' (Hilbrandt and Grafe, 2022: 902). Similarly, in their discussion of Green Structural Adjustment as 'a policy architecture seeking to produce cities as investment sites,' Bigger and Webber (2020: 1) show how 'cities must be reformatted in investment-friendly ways' to capture private finance. Those municipalities that are already disenfranchised with higher rates of poverty and experiencing more acute climate impacts are forced to seek financing to address a myriad of challenges simultaneously (Castán Broto, 2017; Hilbrandt and Grafe, 2023), putting wealthier municipalities at an advantage.

In the face of these global and national forces, Renca's story demonstrates that under-resourced municipalities seeking to find a footing within global financial flows for renewable energy infrastructure are experiencing a different sort of sacrifice. Renca is a municipality with unusual political capital, including an entrepreneurial capacity to develop national and international partnerships, but this positioning is only useful to a point. The municipality and the industrial partners with operations in Renca hold competing views of the use of urban spaces and thus competing energy visions (Castán Broto and Sanzana Calvet, 2020). Once sacrificed as the location of toxic fossil fuel production, Renca is now sacrificed when espousing an energy pathway that is deemed uninvestable. The municipality of Renca sought to retain its own vision of energy transition centered around retrofitting the power plant, while simultaneously capturing global investment. Accomplishing this would deliver a nationally symbolic transformation of a polluting infrastructure and demonstrate the entrepreneurial power of subnational entities, even those in historic sacrifice zones. To achieve this feat, Renca was willing to adapt its financial structures to capture global investment and tie its district energy system to an international financier and to the power plant company. Renca's attempts to bend

to this requirement did not produce enough alignment to finance its distinct vision, likely the case for the energy visions of many municipalities globally that are passed over as uninvestable.

Renca's story, positioned within a local energy *dispositif*, also advances our understanding of governance beyond the state (Bulkeley and Schroeder, 2012) as well as beyond the concept of assemblage. The attention to diverse socio-material elements through the dispositif facilitates a departure from focusing on 'the central steering agency of 'the state' in orchestrating governance' and tendencies to see governance capacity as state-led. In their application of the concept of dispositif to office building energy performance, McGuirk and Dowling (2020: 2) describe a coherence of diverse elements and forms of power that generates the capacity to govern urban energy agendas. What sets aside the concept of *dispositif* from assemblage is the presence of disciplining power (Pløger, 2008) or *power over* (Agamben et al., 2009; Fredriksen, 2015) 'entrained subjects' (Bracking, 2019: 715) . While the broader concept of assemblage conveys 'emergence,' the idea of *dispositif* is characterized by a more settled or fixed power of 'resultant formation' (Fredriksen, 2015: 12). Financialization is one mode of cohering governance capacity, 'shaped around market-oriented, calculative logics informed by financial incentives, future-proofing investment and enhancing market value and rental yields (McGuirk and Dowling, 2020: 18).

In the context of these explorations of the concept of dispositif described above, the case of Renca offers a demonstration of the settled power that states wield and that cities experience in navigating the realization of their visions for energy transition. While Renca's plan was to undertake a historically symbolic and material overhaul of the city's long-polluting power plant, the Energy Ministry and its global partners were the ones framing, or narrowing, the arena of intervention (Li, 2007; Stripple and Bulkeley, 2019). From the perspective of the Energy Ministry and its global partners, feasibility rested entirely on the project's alignment with the designs of prospective investors. Feasibility studies for district energy pilots undertook the political work of shaping municipalities into sites of intervention and legitimizing private investment as the sole avenue for realizing these systems (McGuirk and Dowling, 2020; Stripple and Bulkeley, 2019). As part of the coherence of socio-material elements in the dispositif, the feasibility studies guided the selection of where to ground the financing for the pilots, resulting in Renca's inability to realize its vision. This case thus offers an example of the disciplining effect of the dispositif in urban energy governance, and substantiates the power of the central state in defining financing directions for energy transition.

6.4 Elevating the subnational experience through a multi-scalar lens

This thesis centered on a country's journey through a divided energy transition, aiming to demonstrate how relationships across scales are critical to understanding energy market-making. Chile's energy transition pathway has involved contradictory approaches playing out at different scales, with global investors, the central state, and the subnational state all playing distinct and intertwined roles. Given the disciplinary nature of the energy transition

pathway that global financial actors and the central state are advancing, any distinct local visions for energy transition are likely to remain stifled. Discourses and devices used across these scales uncover distinct and often contrasting visions of energy futures. Financial actors use indexes to create a spectacle and dispel concerns of risk to guide investors toward liberalized economies, constructing a new Latin American frontier. In parallel, and in a concerted manner, the Chilean Energy ministry dispatched the tender in its most streamlined form, designing a bidding process that assuaged investor concerns enough to harness unprecedented foreign investment in the country's renewable energy generation infrastructure.

While the Energy ministry is prioritizing large-scale generation to facilitate a switch away from fossil fuel generation, municipalities such as Renca are struggling to pursue a smaller-scale local transition that is both technological and structural in nature. Renca's unique entrepreneurial capacity allows it to position itself with the national state and global actors as a potential location to capture global investment, and temporary alignment emerges around the district energy pilot. But carrying a settled centralized power, the local energy dispositif temporarily encircling Renca declines to confirm the investability of the power plant retrofit. The symbolic transformation that Renca seeks includes a form of amends related to past injustices and addressing present socio-economic vulnerabilities. Such a transformation would involve some level of disruption of these power structures at other scales, but at the same time Renca's vision is largely dependent on its investability as measured by the existing financial structures. Alternatives to Chile's model for energy transition do exist, but these solutions are also up against the same power structures.

Alternatives to large-scale infrastructure are often imagined as technologies that center small-scale, local, decentralized, or distributed approaches, although these are also not without drawbacks (Knuth et al., 2022). While they may inject some welcome diversity of scale into the mix, similar power structures remain at play and small-scale distributed generation does not 'automatically result in a reconfiguration of political, economic and social power structures' (Baker et al., 2021). With cost and other factors remaining a challenge, these types of solutions are often taken up first by wealthy consumers and require municipalities to play a leading role (Baker et al., 2021), while vulnerable groups are often left out and rollout can be slower (Nordholm and Sareen, 2021). Smaller-scale solutions are also gaining the attention of investors and risk being subject to increasing financialization (Knuth, 2018). In cases where distributed generation is employed to extend energy access beyond the grid, it is often understood as a temporary solution that will at some point be replaced by grid extension (Fathoni and Setyowati, 2022).

Alongside the scale of infrastructure are alternative governance structures that are more centered in tenets of justice and democracy, although the potential of such approaches being sustained in the Chilean context is yet to be seen. Energy justice highlights the distribution of benefits and burdens, recognition of historical and current disparities in energy systems, and procedures and decision making related to remediation (Baker et al., 2023; Jenkins, 2019). An energy system following this lens would be one that 'fairly distributes both the benefits and burdens of energy services, and one that contributes to more representative and inclusive

energy decision-making' (Sovacool et al., 2017: 2). Critiquing a universalized concept of energy justice, the decolonial perspective is that energy systems and policies inherently carry injustices, such that a place-based understanding of these systems must be at the forefront (Tornel, 2023). Similarly, the concept of energy democracy emphasizes decision making processes surrounding energy systems, particularly notions of participation, collectivity, and ownership. Energy democracy is sometimes understood as a 'blueprint for an ideal world where energy systems are more decentralised and socially controlled, access is equitable and benefits dispersed, and energy consumption and production harms neither people or environment' (van Veelen and van der Horst, 2018: 20). It involves the 'concern for who controls the means of energy production and consumption' (Jenkins, 2019: 82) and can provide 'a socio-political counter-narrative to mainstream post-political transition narratives that position renewable energy transitions within a broadly dominant neoliberal hegemony' (Burke, 2018: 2). Alternative approaches can also be couched as reparations or amends for an energy system that 'depends on regressive taxes and utility rates, exclusion from new clean energy technologies available only to homeowners, and the racialized designation of certain areas and people as 'pollution sinks'' (Luke and Heynen, 2020: 605).

Renca's notable attempt to bring other factors besides investability into the frame represents a proposed disruption of the state's vision of energy transition. But in the end, various aspects of the national state's approach, notably through the tender and stunted regionalization processes, add up to considerable centralized control of the country's energy transition pathway. The biggest winners are investors and multinational energy companies. Among the losers are smaller Chilean energy companies that can no longer compete, under-resourced municipalities that seek to tackle energy poverty and access, social movements opposing large and financialized infrastructure, and anyone vying for a more transformative approach to energy transition. For Renca and other cities like it to realize their vision, the central state would need to make more room for other factors besides the investability aims of global financial actors and strengthen the authority of subnational actors to set the terms of local energy transition.

6.5 Limitations

The thesis has a series of limitations, the primary one being that the conceptual framework encompasses a broad range of literatures while also seeking to address multiple scales. The thesis' conceptual framework draws from literature on political economy, financialization, cultural economy, and urban climate finance to understand market-making in energy transition in the Global South. This framing is used to investigate the power of financial actors in creating investment directions, of the central state in making a national energy market, and of subnational actors pursuing their own vision of energy transition within this context. Engaging with multiple areas of literature alongside multiple scales was extremely valuable in demonstrating the complexity of the various factors and systems involved in energy transition; however, melding these varied concepts into a single framework that could serve multiple scales was more challenging than applying those literatures to a single scale or a single local case with bounded geography.

While in many ways the use of multiple areas of literature helped to incorporate various concepts that were found to be highly relevant to the empirical focus, there were also constraints tied to these literatures. The use of political economy literature helped to explore the close relationship between the state and the global financial sector. However, there wasn't enough time to identify the Chilean central state's relationships with specific companies and whether those relationships impacted the tender design and tender results. In terms of data access, it wasn't possible to access contracts between the central state and winning companies to understand the details of those agreements or probe the extent to which on-selling or other changes in company plans over time were detrimental to the state's plans. In relation to applying concepts from the cultural economy lens, it is difficult to attribute the connection between the discourses of financial actors or the central state to their impacts on renewable energy investments or the regional investment boom. To better understand the tender as a device, it would have been useful for fieldwork in Chile to coincide with one of the tender events, particularly to advance analysis of the performance aspects of the event and to observe actors involved in the process. This option would have also helped to identify and conduct interviews with companies that did not win bids. However, the tender round I expected to participate in was postponed due to the national protests. The *dispositif* concept turned out to be a valuable concept to understand power differentials related to subnational governance, but I would have preferred to reference additional examples of applications of the concept to other cities or cases to be able to compare and contrast. Using a conceptual framework that emphasizes the dispersed nature of governance ends up delivering some findings that could be considered dispersed themselves, making it difficult to turn them into concrete policy or action recommendations.

The multi-scalar approach also introduced constraints. While the nested case study approach across three scales matched my interests and was valuable in understanding the global context and each scale within that context, this broad scope also prevented a deeper dive into data collection at each scale. At the global scale, time constraints led me to rely on my own interpretations of renewable energy indexes, and in retrospect it would have been instructive to interview the makers of these indexes or other representatives of the financial firms that make them. An approach focused exclusively on the national scale in Chile might have delved deeper into decentralized infrastructure and financing alternatives to utility-scale generation plants financed via tender processes. A deeper articulation of alternatives, perhaps through interviews with a wider group of non-profit advocacy organizations, may have informed alternatives to the tender mechanism. And finally an exclusive focus on the local scale might have involved interviews with more of Renca's industrial partners, focus groups with community members, or transect walks and similar geographical data collection methods that other similar studies have employed.

Several other limitations related to scope emerged. Applying the conceptual framework to cases that are positioned at one end of a spectrum meant that other experiences of national or local governance went unexplored. Chile is a uniquely neoliberal stronghold while also having a long history of centralization, which explains its streamlined approach to tenders. And Renca is a

unique case in that its entrepreneurial abilities can be seen as an outlier compared to other cities. Although very valuable as examples of market-making and energy transition governance, these cases are not necessarily generalizable across Chile or across Latin America. The broad conceptual framework and multi-scalar lens also didn't facilitate time for exploring or envisioning alternatives, despite some of the literature that illustrates the value of doing so. And finally, the challenge of identifying accurate information on tender awards led to a narrowed temporal scope aligned with key rounds of that process.

6.6 Policy implications

While the focus of this research does not lend itself to targeted policy advice related to the current Chilean context, this project has surfaced the considerable drawbacks of a state approach to energy transition that prioritizes the requirements of global investors while concealing essential aspects of energy systems that matter to the Chilean people. This section offers a discussion of broad policy implications at the three scales. At the national scale, new modes of energy generation procurement that center the socio-economic aspects of energy systems; at the local scale, fiscal decentralization to support under-resourced local governments in the realization of their energy transition vision; and globally, decoupling financialization from energy systems governance.

6.6.1 Centering socio-economic aims in energy generation procurement

The design of Chile's tender, representing the purest version of this tool focused exclusively on price, suggests that we need better methods for procuring energy generation that address the broader and socio-economic aspects of energy transition. As described above, the tender is a device that removes all possible obstacles for structural incumbents to sustain and grow their dominance, delivering control of energy systems to foreign companies motivated by opportunities for financialization. International organizations continue to advocate for designing tenders in ways that compel investors to support local workforce and economic development and other benefits that respond to the local realities of energy systems (USAID, 2021). However, these pathways are entirely voluntary and there is scant evidence of tenders being designed in ways that address community expectations. Alongside this thesis, explorations of tenders show they often fail to benefit communities at the site of generation projects (Baker, 2021). Thus, rather than encouraging states to redesign tenders in ways that serve their communities, especially those operating squarely within neoliberal frameworks, there is a need for new procurement tools that center the socio-economic aspects of energy systems.

6.6.2 Fiscal decentralization to support under-resourced local governments

Renca's case demonstrates what happens when a local government sets a distinct vision for local energy transition that constitutes a disruption of how the central state operates. In Chile,

municipalities are often described as being the closest to community interests, and reforms over many decades have slowly altered the authority of both regional administrations and local comunas (Montecinos, 2023). But municipalities are afforded neither sufficient authority nor channels to finance their priorities. For Renca and other Chilean cities to put their visions into effect, the central state would need to demonstrate that it values other aspects of energy procurement beyond investability and shift some control to regional and local authorities. In its 2021 report on the global status of renewables in cities, the organization REN21 confirms:

> 'The degree of regulatory and financial power that a national government grants to a city government is decisive in that city's ability to advance the deployment and use of renewables. Local renewable energy production, target-setting and policy making are all influenced by state/provincial, national and regional regulatory and policy frameworks' (REN21, 2021).

In a 2017 assessment of how Chile might approach decentralization, the OECD pointed to fiscal reforms, such as improving the municipal financing system to enhance the financial and borrowing capacity of local governments, and reforming the Municipal Common Fund that provides insufficient transfers to municipalities (OECD, 2017).

Fiscal decentralization is critical to financing any type of local initiative in Chile, but such efforts would also positively impact local energy transition. Various efforts to distribute more state power to regional governments and *comunas* rest on questions of subnational financing (Larraín, 2022). Attempts by Chilean municipalities to finance local projects on any topic are 'compromised by subordination to centrally imposed parameters and to central government signals regarding the areas to be funded year after year' (Moller Domínguez, 2023). Some progress has been made in terms of the election of regional governors and other aspects of regionalization, but the fiscal aspects of decentralization have seen less progress (Sepulveda Salgado, 2020). Even across the polarized approaches to the establishment of a new constitution that emerged after the social outbreak of 2019, both the progressive and conservative proposals emphasized principles of decentralization (Reyes, 2024).

In addition to greater opportunities for comunas to pursue and finance their own energy transition priorities, this research project surfaced the importance of under-resourced comunas such as Renca receiving targeted support. Many cities like Renca are forced to prioritize their community's basic needs related to poverty, health, and education. Whereas wealthier comunas were able to more easily replicate the Swiss local energy planning model, it has been more difficult in poor comunas. The roll out of *Comuna Energetica* in Chile happened against a backdrop of significant income inequality between municipalities, leaving the wealthier and better resourced municipalities with more chances for self-determination.

6.6.3 Decouple financialization from energy systems governance

The financial sector demonstrates the power of an 'unelected government' (Castree and Christophers, 2015: 379), wielding tremendous power over energy systems by using the narrow criteria of investability to rank whether countries deserve investment or not, and ignoring many other factors such as energy poverty or financial need. But this research project has reinforced that the myriad aspects of energy systems are made invisible by global financial actors, and decisions about energy transition should instead reflect the needs of people and places most affected by those decisions. In their surprisingly optimistic discussion of the financing of green infrastructure, Castree and Christopers 'see signs of hope, not least in historical (and contemporary) examples of finance being put to extraeconomic ends' (Castree and Christophers, 2015: 385). They cite examples of 'socially progressive, large-scale, infrastructure-oriented capital switches' (Castree and Christophers, 2015: 384) and suggest that states helping to channel finance can 'realize its profound potential to remake the arteries through which capital flows' (Castree and Christophers, 2015: 385). Nearly a decade later, Christophers (2024) argued that transitioning to renewable energy has not proven profitable enough and that governance of energy systems should be shifted back toward the remit of the state. This is the project that Chileans have been grappling with, the extent and nature of the central state's power in energy governance and market-making. In recent history there have been moments of majority support for a new constitution that would dismantle market-led governance as dictated by Pinochet's neoliberal legacy. The viability of that agenda also serves as a referendum on the central state's approach to energy systems governance.

6.7 Future research

This research project contributes to our understanding of market-making and energy transition pathways in the Global South. Investigating the discourses and devices involved helps to uncover factors that are not always in view, including multiscalar processes, the power of investors and the role of the state in creating markets, and the discursive and material elements that are assembled. Future research areas as outlined below include any aspects of structural transformation that would reduce constraints on the national and subnational state, alternative framings and pathways tied to multiple scales, the intersection of cultural economy and financialization of energy pathways in additional country contexts, and other examples of municipalities with structural vulnerabilities seeking an equitable energy transition.

Given that states are highly constrained in the investment directions they can pursue in the context of a global financialized environment for developing renewable energy infrastructure, more research is needed into avenues for structural transformation. The findings from this research project demonstrate that the central state's role in Chile has brought about mostly a technological transition without sufficient attention to factors beyond price. Globally, the state has historically driven the construction of centralized grids, and less understood is its potential role in the creation of more just and democratic energy systems (van Veelen and van der Horst, 2018). Financing channels end up prioritizing 'stable revenue streams that are attached to

ring-fenceable green infrastructure developments' rather than basing investment decisions on climate risks (Grafe et al., 2023: 11) or integration into broader city planning (Hilbrandt and Grafe, 2023). The state is 'structurally biased towards the reproduction of prevailing relations,' but this bias emerges selectively and there is evidence that 'struggle within and outside of the state can shape its form and function' (Angel, 2017: 561). In view of the fractured nature of energy transition across the national and subnational scales in Chile, additional examination could investigate how needs at these scales might be better balanced.

Alternate framings are needed to visibilize and reincorporate the elements made invisible by standardized framings of energy systems. These may conceptualize the redirection of finance based on the priorities of local communities and municipalities, such as Luke and Heynen's (2020) thought experiment of directing financing designated for solar infrastructure for homeowners to instead support community solar projects that address energy poverty and housing insecurity. Or they may build 'alternative political-economic projects for the energy transition' through counter-mapping (Avila et al., 2022: 1057). There is growing documentation of efforts rejecting the financialization of electricity generation and centering poverty and climate change in the organization of energy systems (Luke and Huber, 2022), but it is helpful to connect these bottom-up approaches to the positioning of the national state within the global financial environment, and particularly alternatives to the existing tools that central states use, such as tenders, to finance renewable energy generation.

This research project is also an example of the benefits of a focus on the intersection of cultural economy and financialization of energy pathways, which would be useful to apply to other country contexts. This dovetails with calls to understand how narratives and visualizations inform energy transition pathways (McCarthy and Thatcher, 2019). There is ample room for examining the numerous actors and processes involved in renewable energy procurement in emerging markets and developing countries, and particularly the connection between global markets and local realities. There is also room to explore narratives and counter-narratives around the financing of smaller scale and community-owned infrastructure.

In the urban sphere, it will be important to expand our understanding of cities that must balance energy transition priorities with the need to address structural vulnerabilities (Castán Broto, 2017), particularly in the Global South (Robin and Castán Broto, 2021). Finance is currently guided toward certain countries and cities while other locations are left aside, thus a need for efforts to even out the double disenfranchisement of municipalities that face both climate and financing challenges (Hilbrandt and Grafe, 2023). Renca is one important example of a municipality steeped in this double disenfranchisement, rooted in local sacrifices caused by the country's most polluting power plant. In his second term, Mayor Castro continued to position the comuna as an innovator and leader, emphasizing that addressing Renca's inequalities involves 'close collaboration with the Central Government, the Regional Government, the private sector and various international organizations; all of whom recognize the tremendous potential of our comuna in various areas of development' (Dnews, 2024). In our continued examinations of energy transition pathways, centering similar or contrary examples of cities caught in this positioning will be illuminating.

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Annex 1: Interviews

Organization	**Type**
Sustainable Energy for All	International organization
Latin American & Caribbean Council on Renewable Energy (LAC-CORE)	Industry
InterAmerican Development Bank	Regional development bank
Energia para Todos	NGO
Enel X	Industry
Energy Poverty Network (RedPE)	Academia/NGO
Comuna Energetica, Sustainable Energy Agency	Government
Participation and Community Relations, Energy Ministry	Government
Access and Social Development, Energy Ministry	Government
Technosteel	Industry
Center on Energy, Universidad de Chile	Academia
Generadoras de Chile	Industry association
Economic Commission for Latin America and the Caribbean	Regional organization
Kings College London	Academia
Deggendorf Institute of Technology	Academia
Fundacion Avina	NGO
REN21	NGO

Ministry of Industry, Energy and Tourism; Government of Spain	Government
Forestry Institute, Ministry of Agriculture	Government
Regional division, Ministry of Energy	Government
Tender Unit, National Energy Commission	Government
Comuna of Puente Alto	Government
Tractabel/Engie	Industry
UNEP District Heating Initiative	United Nations
Environmental division, Comuna of Renca	Government
EBP	Consulting firm
SEREMI, Ministry of Energy	Government
District Energy, Ministry of Energy	Government
Municipal Corporation of Renca	Government
Generadora Metropolitana	Industry
Chilean Institute of Municipal Studies, Universidad Autonoma de Chile	Academia
Fundacion Huella Local	NGO
UNEP-DTU Partnership	United Nations

Annex 2: Participant observation events

Event	*Organizer*
Forum and International Fair for the Environment and Sustainability (FIMAS)	Association of Businesses and Professionals for the Environment (AEPA)
Latin America Energy Summit 2019	Industry Exchange LLC
Solar World Congress	International Solar Energy Society (ISES)
RedPE International Seminar	Energy Poverty Network (RedPE), Universidad de Chile
Local energy strategy preparatory meeting	Comuna Energetica program / Comuna of Puente Alto
Business roundtable workshop	Comuna of Renca and Fundación Huella Local
National protests of the social outbreak	Chilean social movements

Annex 3: Additional images from national revolt 2019

Protestors took over downtown Santiago

Source: Marcelo Hernandez

Graffiti in Santiago 'Enel thief' (Enel is Chile' largest electricity utility)

Source: author

Posters in Santiago reading 'Terrorism of the state' and "Until dignity becomes normalized'

Source: author

Renca was a key site of the national revolt of 2019

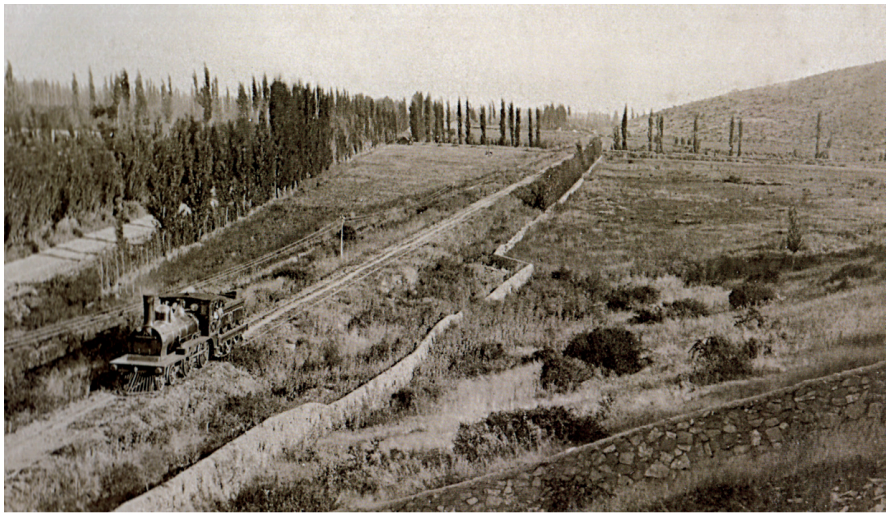
Source: (Correo de los Trabajadores, 2021)

Banners in Renca reading ‘Renca woke up’ mirroring the common protest saying ‘Chile woke up,’ and ‘Fight until you win’ referencing the army’s rubber bullets targeted at protestor eye mutilation

Source: author

Annex 4: Additional historical and current images related to Renca

Train tracks through Renca, circa 1870



(Fernández Castillo and Vila Muga, 2021)

Family at the corner of Candell and Balmaceda streets

(Amo Santiago, 2016)

View of Renca Hill, approximately 1960, archive of the Quiroz Gómez family

(Patrimonio Fotográfico de Renca, 2017)

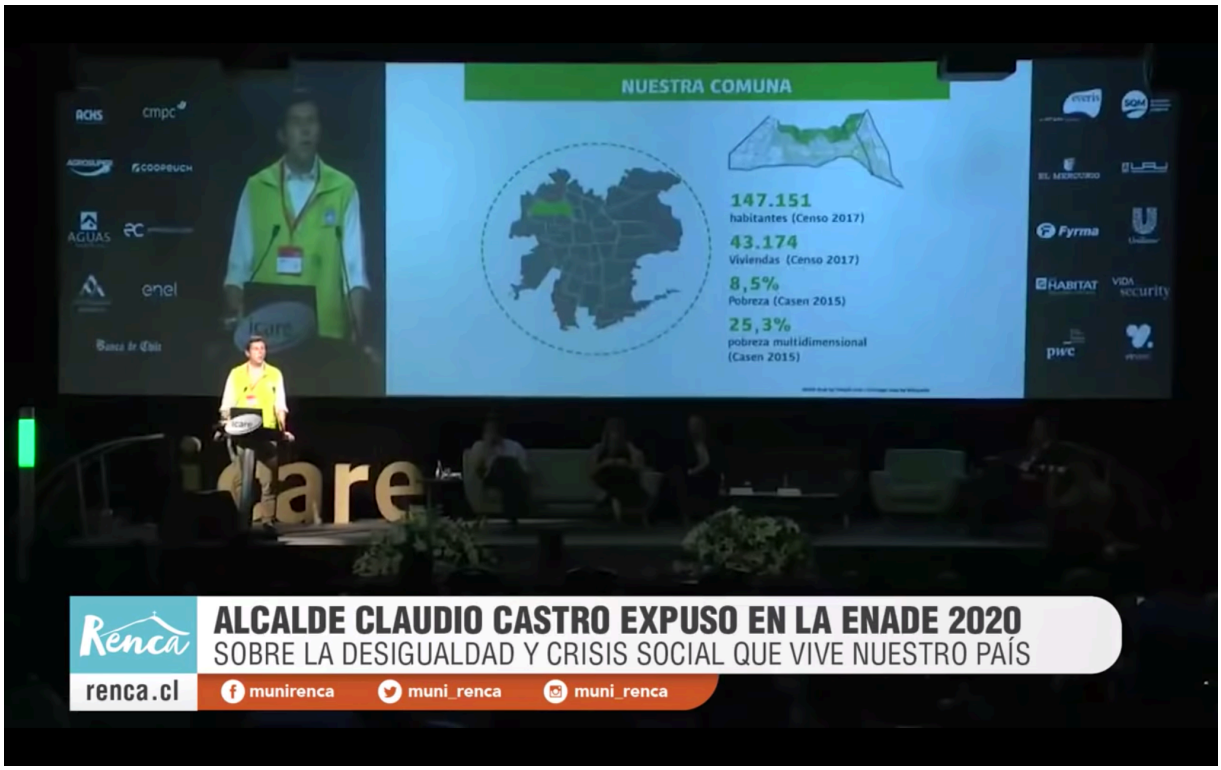
Entrance to the municipality of Renca

Source: author

Mayor Castro's advocacy for municipalities during national protest featured in national magazine

Source: (El Mercurio, 2019)

Mayor Castro explains municipal inequality during national revolt at national conference



Source: (Municipalidad de Renca, 2020)