
HYDROPOWER OR PRIVATE POWER

River Development Resistance in the Chilean Landscape

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DEDICATION

To Ella Bump

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ABSTRACT

This thesis centers on hydropower development and questions its continuing expansion as subsequent ecological and social challenges compound. Connected through the political ecology context, these issues present themselves through hydropower impacts, privatized water management obligations, and social power relations. Although hydropower can be generated in an ecologically unobtrusive and locally beneficial manner, factor dependent, the global trend exposing the contrary to this ideal cannot be ignored. I establish this stance drawing from several realms: hydropower's global presence, scientific impact analyses of basin alterations, the political and economic influences upon water allocation, human relations with water management, and finally social responses to river development decisions. Like many others, the Chilean government continues to promote hydropower as their dominant "renewable" energy despite contention of this portrayal. This dispute is due not only to river fragmentation ramifications and community degradation, human and other, but also to underlying profit motivations.

I establish the core of this study, which focuses on the numerous strategies social resistance movements utilize in combating hydro developments in Chile, through the semi-structured interviews I conducted there in January 2016. I emphasize the ways in which Chile's multilayered relationship with hydropower has been built on a privatized platform, solidified by weak environmental legislation and political allegiances to industry, and has ultimately produced integrity issues within its centralized government. The first four case studies I analyze focus on the effectiveness of resistances to hydro developments on the Bío Bío, Futaleufú, Baker, Pascua, and Puelo rivers. These situations serve as a basis on which I establish a more in-depth study of the Maipo River and the ongoing Alto Maipo project. Although the obstacles social resistances face are often case specific, larger trans-regional and international dynamics play important roles throughout. As the Alto Maipo project and other development plans are ongoing, I present conclusions based off of information as current as April 2016. These inferences reference the Chilean political and private context regarding policy change, small-scale hydro development, causes and consequences of civilian passivity, and potential influences of tourism.

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Introduction

Surface water management systems¹ have been greatly shaped through political contexts, non-governmental interests, and profit motivated allocation strategies. Expanding agriculture, climate variations, encroaching urbanization, and energy generation are demanding more of river ecosystem services,² pushing these resources to their limits. These factors and others are stressing often dated and un-adaptive water management systems to the point of inducing both ecological and social conflicts. “In addition to behaving according to the physical laws of hydrology, [water] also flows through social power relations” (Prieto 2014, 43). Inequitable water management decisions all but guarantee substantial repercussions throughout these relations. Resulting social tensions, which emanate from peoples directly dependent and indirectly connected to basin functions,³ are continually unfolding both within and between political boundaries and economic systems.

In many regions, energy demand has become reliant upon hydropower production. As river systems both support and rely upon intricate dependencies, anthropogenic alterations of their flows have spurred equally complex management dilemmas. Hydro projects of all scales are thus potential sources of contention between many ecological, political, economic, and social relationships. Political ecology⁴ thus becomes a lens through which to analyze river development implications and their engagement with these relationships. In terms of political economic patterns, water management systems have often generated preferential policies benefitting more politically and economically influential consumers, such as private hydropower companies. Hydropower's institutionalized presence in many nations, potentially influenced by

¹ A water management system consists of a governing body that dictates policy and regulation regarding the allocation and development of a water resource, ideally maintaining equitable usage despite competing demand. For more information, see (Quentin 2011).

² For a greater understanding of what ecosystem services are and how rivers provide them, please reference (Loomis 2000).

³ A river basin is an area of land drained by a network of watercourses flowing into one main stream. For more information on river basin dynamics, please see (Mostert 1999).

⁴ Political ecology will be discussed and more specifically defined in section “Political Ecology of Neoliberal Management and Private Development.” Refer to (Minch 2011) for an in depth analysis of political ecology.

privatized allocation, is becoming exponentially misaligned with water quantity and quality standards, jeopardizing both ecological health and social prosperity.

These dynamics, although present throughout the globe, have been pushed to the forefront in South America. In the past two decades, Chile's privatized water management has generated social tensions which continue to accumulate and combust throughout the country's fifteen regions. Chile's multilayered relationship with hydropower has drawn both national and international attention since the 1990s, largely due to movements opposing specific hydro projects. Despite previous analyses of hydropower conflicts in Chile, the continuation of both hydro development and subsequent social resistances must be accompanied with vigilant consideration. This thesis aims to provide such consideration, while respecting the infinitely complex dynamics within the Chilean landscape that a nonnative cannot fully articulate nor comprehend.

Before delving into the Chile's relationship with hydropower, I will first present a context through which to better relate Chilean dynamics with broader issues presented by river development asking: *In what ways are hydropower, privatization, and social power relations connected through political ecology? Considering these relationships, how can resistance movements influence river development decisions?*

Hydropower Infrastructure and Impact

In order to properly analyze hydropower, both on a theoretical and practical scale, developing a basic understanding of its implications is necessary. Hydro's physical infrastructures, potential benefits, ramifications, and broader climate interactions, although seemingly disjointed from the core focus of this thesis, are critical in gaining insight to social resistance motivations and strategies presented further on. Additionally, the common portrayal of hydropower as a "renewable" energy will become relevant as I explore political economic contexts. Although there are far more factors involved than I present here, the discussion below serves as a basis in displaying the complexity and depth of consideration hydro development necessitates.

Global Presence

Large and small-scale river development is now routine worldwide. By 2011, there were approximately 37,600 dams higher than fifteen meters on earth (International Commission on

Large Dams 2011). This does not account for the thousands of small-scale and run-of-river projects. Figure 1. displays the 3,700 new major hydro projects, more than one megawatt (MW) production capacity, which were either in the planning or construction phase as of 2014 (Zarfl 2014). As global energy demand is anticipated to rise from 2014 - 2040 by 56%, such an intense hydropower development era does not seem likely to slow.

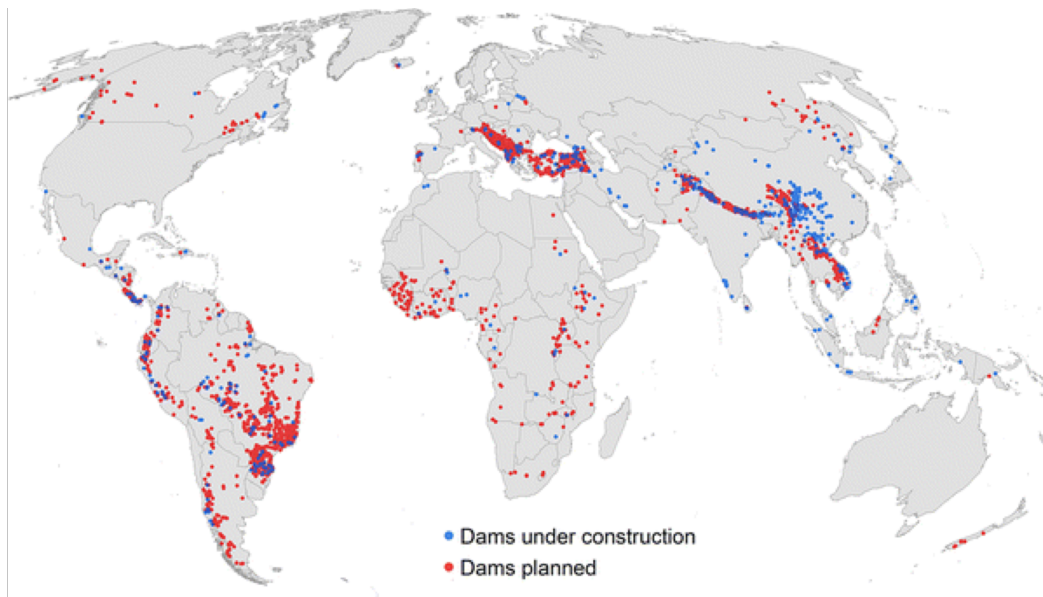


Figure 1. The distribution of planned and currently being constructed hydropower projects as of 2014, not including small-scale or run-of-river developments (Zarfl 2014).

Infrastructure

Hydro projects utilizing surface water most prominently include dam based reservoir systems or run-of-river (ROR) pipe systems, both of which use gravitational forces to instill and then harness water's kinetic energy. For either of these systems, developers target rivers based on factors such as temporal flow patterns, surrounding topography and geology, relative location of urban centers, and potential MW capacity. The MW production capacity of a hydro project is generally dependent on the volume of water moving through the system, and also the elevation difference between the system's inflow and outflow.

Hydropower reservoir systems⁵ store large volumes of water behind river wide dams. Generally, these dams have an intake opening which runs water through a penstock and then rotates a turbine that is connected to a generator. The energy produced by the generator,

⁵ For more details and diagrams, please see (Perlman 2015).

converted within a powerhouse, is then transported through a system of power lines and towers, which require road infrastructure. Water exits the system through an outflow channel, which can also consist of constructed spillways to decrease erosion potential.

Most commonly, ROR systems⁶ function by siphoning a river's water out of the bed through an intake infrastructure, which generates little to no storage. The water then runs through a tube system, potentially tunneled underground, and then enters a turbine/powerhouse generation system at a lower elevation (Haddad 2011). The water is released from the system downstream of the original collection zone. Like reservoir systems, ROR requires similar power transportation infrastructure and road development.

Benefits

The overarching goals of hydropower are to generate clean, low cost, renewable energy, in addition to other project specific benefits. For example, hydro can theoretically produce a constant flow of energy depending on basin conditions and the type of generation system used. Reservoir hydro is also able to match energy demand fluctuations, increasing or decreasing stored water use. As hydro harnesses kinetic energy, minimal emissions are produced during operation. Additionally, once a catchment, production, and transportation system is constructed, either reservoir or ROR operating costs are virtually non-existent (Prieto 2012). Beyond energy production, reservoir storage can also be used for irrigation purposes, inland water transport, or flood mitigation, on a range of scales (Ansar 2014). ROR developments, although unable to store mass quantities of water, can potentially produce constant energy while maintaining a river's flow regime.

Ramifications

While all forms of energy production and transportation infrastructures have various ramifications, due to the amalgamating nature of river basins, hydro development impacts also expand throughout the networks in which they are constructed. Whether a project's ramifications outweigh its benefits is dependent on many case specific factors, and is ideally judged considering long-term ecological and social prosperity through impartial analysis. Analysis must further account for uncertainty of ecological limits of hydrologic alterations (ELOHA). While calculable in some regards through the use of modeling and analysis of individual river

⁶ For infrastructure specifics and a diagram, please see (SmallHydro 2009).

characteristics, ELOHAs are less predictable due to "the confounding of hydrologic alteration with other important environmental determinants of river ecosystem condition" (Poff 2010, 2).

Through river fragmentation, dam and ROR systems impact flow dependent ecosystems (Bunn 2002). Reservoirs specifically alter both upstream and downstream temperature averages by generating a relatively stagnant and deep reservoir, and allowing downstream release of often only one temperature regime through the penstock. Sediment accumulation behind a dam not only creates lateral pressure upon the structure, but lends itself to eutrophication due to the halting of nutrient and pollutant downstream transport combined with potentially increased surface temperatures (Grant 2003). Reservoirs also generate deforestation of the previously terrestrial land their water covers. Release of methane occurs due to decaying organic material in the newly anaerobic environment (Maeck 2013). Among numerous other impacts, reservoir filling can force or block species migrations generating ripple effects upon both flora and fauna (Avakyan 2002). Failure risk is also a possibility that must be considered and monitored effectively (Hartfort 2011). While ROR systems do not generate large reservoirs, they have the ability to siphon great portions or the majority of a rivers' water away from its course. Depending on how much flow is utilized, the dewatering of a river section alters sediment transportation, temperature gradients, and other habitat health requirements (Fassnacht 2003). Complete fragmentation of these components is possible if the majority of flow is siphoned. Fish populations, for example, must adapt to halted or degraded migration pathways in either reservoir or ROR systems. Furthermore, a significant flow regime alteration facilitates more successful exotic species invasions (Bunn 2002). When considering these examples in addition to hydraulic uncertainties, it is clear that alteration impacts to river flow regimes must be fully contrasted against potential benefits.

Depending on scale, hydro projects can be physically intrusive and economically burdening. The infrastructure required to generate and transport hydropower can become destructive, especially when accessing more remote areas. For example, roads must be built large enough to move equipment and materials for construction. Additionally, transmission lines and towers needed to connect to a main energy line add to impacts such as deforestation, habitat intrusion, and visual pollution. While actual operation costs are low, construction costs and potential mitigation and damage repair issues can amount to extraordinary financial burden, especially with large developments. As great sums of money are involved, "optimistic

judgments" or justifications for a hydro project "are often exacerbated by deception, i.e. strategic misrepresentation by project promoters" (Ansar 2014, 7). Among management authorities, the reality of profit margins has often promoted an acquired ignorance of not only realistic MW estimations, but also ecological consequences.

All of these impacts vary based on river flow volume, broader basin dynamics, type and size of hydro development constructed, and other anticipated and unpredictable factors. Political flow negotiations, both domestic and transnational, are a prevalent dilemma for both management systems and water users dependent on allocation decisions. As smaller basins often feed into larger systems, treaties and compacts regarding downstream flow requirements, especially in transboundary basins, become more complex when hydro production is an added dynamic. While neutrality is necessary in considering hydro development dynamics, it is undebatable that "hydrologic alteration has impaired riverine ecosystems on a global scale, and the pace and intensity of human development greatly exceeds the ability of scientists to assess the effects on a river-by-river basis" (Poff 2010, 1). This is not to condemn the form of energy, as it has the potential to be used in a locally beneficial and ecologically responsible manner, but rather to take an all encompassing perspective when considering basin alterations.

Interaction with Climate Variation

Increasing climate variations are also straining water management systems. Mitigating current and future concerns from such variation, including drought patterns, is further complicated for systems that are already navigating river development impacts. While the implications of climate variations differ for every basin, general patterns⁷ can be heightened in instances where basin self regulation has already been compromised by fragmentation. These patterns and "altered water cycles...clearly affect the safe and economical operation of dams and reservoirs" (Schleiss 2011, xiii). While some management systems have made efforts to adapt to less predictable flows and overall basin alterations,⁸ many have not sufficiently reacted to

⁷ Many basins dependent on snowpack melt have experienced seasonal abnormalities. Due to warmer average temperatures, precipitation in winter months moves through the system earlier or evaporates more quickly than historically anticipated. Increasingly arid landscapes are emitting more dust which mixes with snowpack and amplifies solar heat attraction, melting snow more rapidly (EPA 2015).

⁸ To ensure that both Mexico and the U.S. would have long-term access to the Colorado basin's water, Minutes 242 and 319 were incorporated in 1973 and 2012 respectively. 319 not only recognized the impacts of climate change and redefined the amount of water Mexico receives

diverging hydrological patterns. Climate change has thus created a new platform for ecological and social instability when considering hydro developments, in addition to economic and political concerns over decreases in reliable energy production.

"Renewable" Energy Portrayal

Hydropower has been promoted by general political standards of "renewable" and "sustainable" energy. Although geothermal, solar, wind, tidal, and biomass energies are portrayed in a similar way,⁹ hydro accounts for the majority of the world's "renewable" energy production. Hydro continues to be included in many countries' energy plans as the main or even sole source of "clean" power. This reliance has clarified that the "mastery of nature may be effective in the short-term in generating rising consumption patterns, but also in masking the long-term implications of ecosystem stress" (McMichael 2011, 11). While the use of water's kinetic energy is renewable in terms of the general hydraulic cycle, climate variations and the compounding nature of basin degradation due to flow fragmentation brings into question the reality of hydropower's "renewable" portrayal. This label is further jeopardized when considering political and economic motivations, which will be discussed later. While there are intricacies beyond the factors emphasized above, this general analysis of implications and impacts presents a logic as to why many human communities question, and in many instances resist, hydropower development.

The Hydrosocial Cycle and Hydropower

This section advances themes behind human involvement in water management, beyond governing bodies, and creates a basis for social reactions to river development. Although I discuss these ideas broadly here, their value in this analysis becomes apparent through the resistance motivations and strategies depicted further on.

Water spans across various social dimensions from a direct dependence upon the substance to sustain human life, to more ambiguous and diverse cultural relationships. In terms of water management, river basins must not only be analyzed as entire systems reliant upon the

based on upstream reservoir levels, but also adapted allocations to improve the ecological health of the Colorado River (IBWC 2012).

⁹ Please reference (Aden 2010), in the context of China, and (Goel 2009) for comparisons of these energies against each other and conventional sources.

health of ecological functions and technical flow regimes, but also as entities which are intertwined with "human values, behavior and organization" (Linton 2013, 170). Importantly, the notion that "hydrological data and knowledge are socially constructed and politically mobilized" emphasizes how incentive shapes water management decisions (Budds 2014, 167). Furthermore, the "material and symbolic characteristics of water also...shap[e] relations and forms of governance" (Budds 2014, 167). These nuanced ideas present ways in which water's various roles in society have come to display complex social reactions to river management and alteration. Profit driven misvaluations of social connection to basin preservation often seem to be the epicenters of social resistance to development decisions.

The hydrosocial cycle is an applicable theory through which to analyze the implications of anthropogenic river alterations and subsequent human responses. As the hydrosocial cycle depicts, water is eternally intertwined within social and power relations on a multitude of scales (Linton 2013). "[H]uman civilization was born on a river bank," and by harnessing its services in different ways this bond has reshaped itself into varying degrees and forms of dependency (Harvey 2016, under "People & Freshwater"). As these relationships are strained through increased demands upon water resources, those who have gained legal control of rivers' flows, and thus energy production potential, have the ability to generate powerful social inequities. The hydrosocial cycle's relevance to injustices generated by inadequate water management is well represented through various hydro developments. As "space and identity has fused struggles over material control of water use systems and territories," conflicts "over the right to culturally define and politically organize these socionatural systems" come to fruition (Boelens 2013, 234). Hydropower resistance movements have and continue to display various layers of these conflicts.

Political Ecology of Neoliberal Management and Private Development

In this section I emphasize how basin management systems in which water is treated as a commodity disregard its fundamental role in ecological health, distort the balance of social power relations, and are predisposed to hydropower development. I establish this stance through the lens of political ecology as well as neoliberal platforms that inherently promote river development as it translates into economic benefit. Generally speaking, political ecology emphasizes the "premise that nature and environmental issues are inherently politicized and cannot be understood in isolation from the political and economic contexts within which they are

produced” (Budds 2004, 5). These contexts, through which water management policies and regulations are formed, predetermine not only long-term ecological stability but also human interactions with water resources. Thus, political ecology illuminates how the roles of political and economic influences commanding hydropower have the ability to distance other necessary considerations from development decisions. More specifically, neoliberal strategies attach a market value to water,¹⁰ or substantiate the commodification of a resource that has value beyond what an economic system can quantify. The regard, or lack thereof, for "environmental consequences in [nations'] prescriptions for development," or economic growth, is a concept that increases in complexity when considering the international private sector's interactions with national water governance (Barbosa 2009, 28). This engagement relies upon the privatization of water, a concept that implies the creation of ownership, transforming for example, a water resource from a public good into a purchasable right.¹¹ “Privatization, therefore, is nothing else than a legally and institutionally condoned, if not encouraged, form of theft” (Swyngedouw 2005, 82). From a neoliberal perspective, market-based management is more efficient and effective, and “private sector involvement in water systems has been...a means of...increasing equity in terms of access to and affordability of water services” (Robinson 2013, 27). The realization of this ideal has been problematic however as hydropower industry interactions with water governance often serve as pertinent examples of misaligned allegiances and social conflict. Private energy corporations have not only developed an extensive international reach, they have also become powerful actors in both global markets and political systems.

Constructing a hydro project has come to imply the creation of a vast network of developers and financiers, often including multinational corporations. Such expansive involvement "underlines a shifting geopolitical situation, with an increasing number of projects financed by internationally operating companies based in foreign countries...general[ly], these parties only seize investment opportunities but are not involved in project development or dam operation" (Zarfl 2014, 168). An example of such a conglomeration is the Brazilian hydropower industry which in a two-year time span, 2010-2012, included financiers from the United States,

¹⁰ For specific examples of applied neoliberal ideology, water privatization transitions, and results, please see (Robinson 2013).

¹¹ Refer to (Swyngedouw 2005) for examples of privatized water management systems, their transitions into becoming as such, and the subsequent increased potential for corrupt practices.

Spain, France, Switzerland, and twenty-eight other contributors (Zarfl 2014). These influences have historically and are currently bringing into question the legitimacy and overall national benefit of many developments, as profit margins from the energy produced are often directed towards foreign groups. The commodification of water, promoted through the neoliberal economic platform, has promoted such financial divisions, physically removing funders from the consequences of their investments. Considering hydropower, this dynamic continues to emphasize "the widespread acceptance of a global corporate ideology," which "has played an important role in rationalizing and sanctifying unequal relations of power" (Campbell 2009, 77). Power dynamics are displayed through the increasingly prevalent social objections to hydro developers' disregard for ramifications of altered flow regimes.

Political Ecology of Social Responses to River Development

Unequal power relations generated by river fragmentation exist within multilayered sociopolitical dynamics. Despite location-specific differences, global analysis presents overarching patterns of hydro development implications. Conflicts continue to rise between those that own the legal right to alter river flows, and those that maintain a relationship dependent on the continuation of historical flow regimes. While it is argued that "ecological problems arise from deep-seated social problems," it could also be interpreted that various social problems have been generated through a misevaluation and thus mismanagement of natural resources like rivers (Barbosa 2009, 30). Often, it is at a local community level where resistances to environmental injustices are most effectively combatted. However, the complex dynamics river basin exploitations produce must not only be analyzed on a multilayered platform, but also mitigated using strategies that draw from more than one field. More quantifiable factors which induce social responses include community displacements, heritage site losses, food security issues, potable water quality degradation, and land damages due to infrastructure construction (Cernea 2004). Ambiguous results often emphasize a general lack of sufficient compensation for quantifiable factors, in addition to intricate economic impacts and community tensions.

Fragmented or delayed information regarding a hydro project in a community deters the ability to make well-educated responses and decisions during a relevant time period. "Social perceptions of the environment are affected by political, economic, and social processes, where those in power often manipulate scientific knowledge to further their own interests" (Campbell

2009, 93). Recognizing the potential for manipulation and fragmentation of information regarding river development is important when considering the potential for large profit margins in the private sector. Furthermore, unofficial compensations and promises such as job opportunities and energy access have contributed to a pattern of intercommunity disagreements over development in many cases. While a citizen energy accessibility gap is felt by many countries, and hydropower is often promoted as a means to close this void, the added energy is often not directed towards citizen energy demand. For example, both Kenya and Tanzania could "supply the whole population with electricity by their hydropower capacity installed at present, if it were not used by industry, for example, for mining operations" (Zarfl 2014, 167).

River development resistance movements, although highly variable based on project type, size, basin flow dependencies, economic relationships, overarching political contexts, and other factors, have become commonalities in many hydro intensive countries. In spite of the conflicting goals of resistance movements and the political and financial powers endorsing hydro development, social strategies have the potential to motivate and shape fundamental changes in water management systems. The extent to which this impact is realized however, depends greatly on the effectiveness and momentum of multilayered resistance strategies.

Chile

In the omnipresent search for economic development and subsequent energy production, hydropower has taken a central role in the global energy portfolio. Historical leaders in hydropower have been the United States, India, China, Brazil, Spain, and Canada, although many smaller countries now rely proportionally more on hydropower production (International Commission on Large Dams 2000). While some hydro development rates have been slowed or even halted, the opposite is true for several South American countries, including Chile. Chile's water management system, like many others in South America, has been an epicenter of social, political, economic and ecological dilemmas for decades. "In the Andes...territorial management and community water use systems...are interwoven with the cultural-political foundations" (Boelens 2013, 235). The many river basins flowing from the Chilean Andes, displayed in figure 2, are no exception to this generalization. Chile has embarked on a hydro development path that continues to emphasize how their "water use systems" are colliding more than they are

“interwoven.” This path, familiar to many other countries, is founded on the notion that hydro developments “have been produced and reproduced as signs of prosperity and modernity” (Leaman-Constanzo 2013, 43).

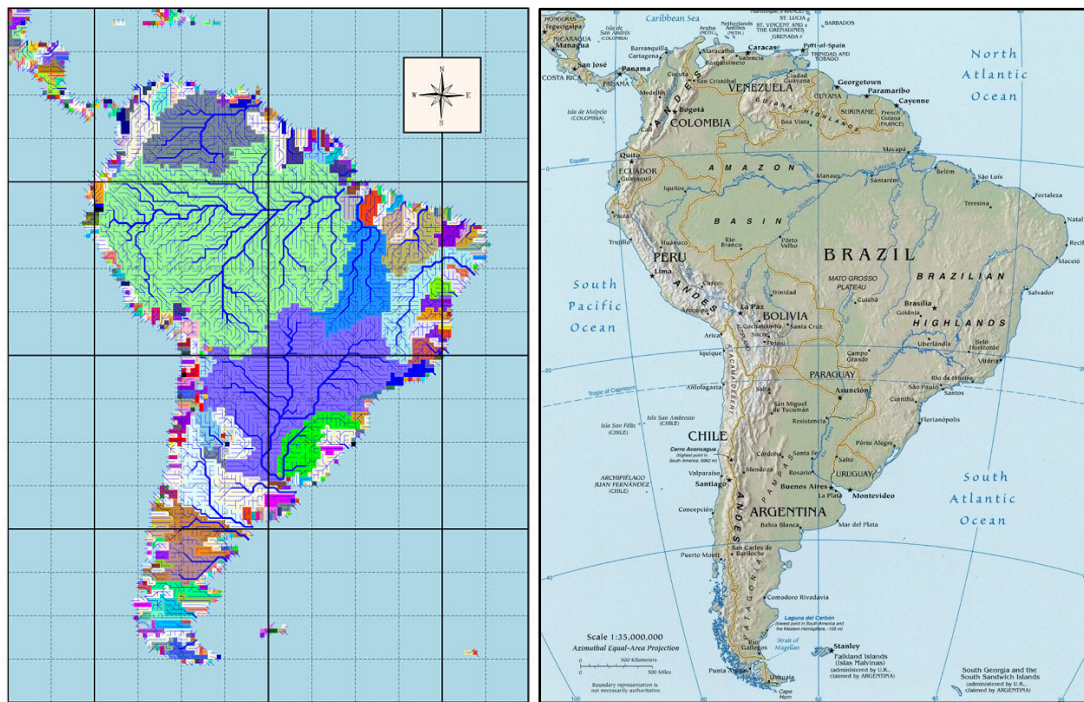


Figure 2. The map of South America to the left depicts each river basin in a different color (R-HydroNET 2016). The map to the right displays each country's name in addition to significant topographical features including the Andes (Geographic Guide 2016).

Most Chilean rivers are legally and economically controlled by private power. This dominance was created and is maintained by actors both within and outside of the political administration, which have institutionalized the authority of hydropower developers. This transition was largely made possible by the application of neoliberal economic policies during the Pinochet regime and the 1981 Water Code. In considering both the political ecology concepts and more specific hydrosocial cycle dynamics previously discussed, I will emphasize the disconnect between such solidified authority and the social, ecological, economic, and political responsibility it demands. Since the 1990s, various hydro development plans have not only made this disconnect clear, but have also depicted a network of influence used to push past public opposition. This network not only involves Chilean political and non-governmental national and international powers, many of which are centralized in Santiago, but also passive actors. Due to this context, social injustices and ecological consequences of river fragmentation are often not

equitably reacted to from a political standpoint as profit motivated interests continue to dictate development decisions.

While Chile's hydropower portfolio grows however, so do the resistance movements to subsequent proposals. The size and effectiveness of such responses are dependent on many variables, which will be explored here, furthering the complexity surrounding Chilean river management. Chilean rivers have become a battleground where "science and nature and technology and politics become so confused and mixed up as to be impossible to untangle...and are triggering our most personal and deepest emotions" (Latour 2012, para. 17). As such strong emotions combined with public perception and available information largely define resistance responses, the consideration of Chilean perspectives regarding these hydro developments is vital. Although Chile's privatized water management system and subsequent hydropower conflicts have been analyzed in detail, the continuation of Chilean river development despite social opposition demands both national and international attention. In light of information as current as April 2016, I inquire as to *what project specific factors and trans-regional political ecology dynamics determine the effectiveness of hydropower resistance movements in Chile?*

In order to properly analyze Chile's relationship with hydropower and thus determine what is necessary to alter the perpetuation of social and ecological upheaval, I focused on five case studies, both past and current projects, which have generated resistance movements. Through collecting and interweaving ideas from the first four cases, I developed a more in depth interpretation of the Maipo river hydro development, Alto Maipo. I used the following methodology to reach this point and answer my question, considering the ongoing and thus fluctuating nature of these resistance movements.

Methodology

Theory Review & Historical Context Development

Through compiling and analyzing academic works, I investigated the management of water as a commodity in relation to neoliberal policies and human interactions with its allocation. In realizing the interconnecting social, political, economic, and ecological factors, I decided to use the political ecology theory as a platform on which to interweave and consider this and further research. I then directed my research towards the historical contexts of river developments, specifically hydropower projects and resulting ecological and social patterns. As

presenting all possible ecological implications of hydro development would have demanded a separate thesis, I chose to emphasize specifics that are relevant to my case studies below. In light of predominant social patterns, I found it important to establish the hydrosocial cycle in my background to construct a more theoretical context before focusing on specific social resistance movements. Finally, I examined these concepts in regards to their prevalence in Chilean history and river management. I studied five specific ongoing developments in Chile with an emphasis upon the strategies social resistances have and are using.

Conduct and Interoperate Interviews

After building this background knowledge, I travelled to Chile and conducted personal semi-structured interviews for approximately two weeks. Before arriving, I developed sets of questions specific to each interviewees' knowledge base and language. Interviewees were selected prior to my trip based on their varied backgrounds, expertise, and relationships with river development. I established this variety in order to both generate an inclusive perspective and also corroborate information. I recorded all interviews to preserve gathered information and for further reflection. While none of the project developers or their employees were successfully contacted and interviewed, I thoroughly reviewed information provided by their official proposals and websites. Upon returning to the U.S., I translated each interview and interoperated them in the context of all Chilean perspectives I heard, in addition to the academic context I had previously developed.

Reconnaissance and Discourse Analysis

While in Chile, I visited as many impact or potential hydro development sites as possible to better comprehend the scope and implications of each project. I also examined both the national and international discourses presented regarding the various hydropower projects by both the developers and opposition groups. I gathered sources through websites, media outlets, and physical billboards and signs I encountered in Chile.

Hydropower Context

Neoliberal Transition

Chilean river management has been fundamentally shaped by the country's political history. Neoliberal ideology was solidified within the Chilean economy during General Augusto

Pinochet's military regime from 1973-1990. The application of this ideology, largely influenced by the U.S. Chicago Boys' free-market strategies,¹² is displayed by the 1980 Constitution (Tecklin 2011). The subsequent policies and “main political argument[s] for private property...guarantees a zone of freedom from state interference,” while promoting a focus on the commodification of natural resources (Bauer 2012, 2). While the transition from military dictatorship to civilian rule was negotiated in 1990, the inherited economic strength and imbedded “environmental politics reveals a disturbing underside to the Chilean miracle,” otherwise known as the Chilean Model (Carruthers 2001, 1). While both the Chilean economic transformation and resulting policies have been analyzed in great detail in relation to hydropower,¹³ a basic understanding of relevant legislation is necessary not only to depict their current implications upon river development, but also to analyze the logic behind social resistance strategies.

Water Code

Passed in 1981, the Water Code is one of the most impactful pieces of legislation that carried over from Pinochet regime. The Code allowed for water rights privatization, virtually selling the majority of Chile’s rivers, while simultaneously separating these rights from connecting land ownership (Carruthers 2008). Water rights are still granted by the national government upon request, at which time the specified water leaves national authority (OECD 2014). Although there are technically six different types of water rights that can be permitted, non-consumptive and consumptive are the most prevalent to hydropower dilemmas. While major controversies are generated by the availability and use of consumptive water rights, engaging with potable water needs and perhaps a wider Chilean audience, I will focus on non-consumptive. Non-consumptive rights determine that water must eventually reenter a river after use, although no holding time is specified, and are permitted as long as the water is physically available (Prieto 2012). If a specific non-consumptive right becomes competitive, meaning that it is desired by more than one stakeholder, the right is allocated to the highest bidder. Beyond original acquisition, there is no additional or systematic payment required for a non-consumptive

¹² Please reference (Huneus 2006) and (Silva 1991) for in-depth analyses of the Pinochet regime and its relationship with the Chicago Boys, economically and beyond.

¹³ Refer to (Budds 2004) for a superior depiction of Chile’s neoliberal policies and their relationship with water management, specifically the Water Code.

right. Once a permit is acquired, it is freely tradable regardless of what the additional uses are, ultimately making rivers cost-free and thus profitable resources (Preito 2012).

Holders of non-consumptive water rights, and the often large networks of national and multinational actors they are attached to, are central in understanding Chile's relationship with hydropower and the five case studies below. Chile's non-consumptive water rights are almost all held or currently being used by three companies: Endesa, American AES Gener, and Colbún (Matte Group) (Belmar, et al. 2010). The most notable entity is Empresa Nacional de Electricidad S.A., or Endesa, which was privatized during the Pinochet regime, and is currently owned by Endesa España, which operates in twelve different countries (Carruthers 2008). Endesa España is in turn owned by the private Italian conglomerate ENEL (ENEL 2014). The Water Code allowed Endesa to obtain eighty percent of Chile's non-consumptive water rights through the year 2020 (Carruthers 2008). Therefore, a private Italian company technically owns most of Chilean non-consumptive water rights.

There have been several amendments to the Water Code since its creation. In 2005, the Code was slightly altered to allow for state rejection of water rights requests if they jeopardize the preservation of minimal ecological flows, although this only created an optional veto rather than a regulation, and no mechanisms for monitoring flows were defined (Belmar, et al. 2010). A tax was also added which penalizes water rights that are not being utilized. If the tax is not paid, the rights are reclaimed and resold by the General Directorate of Water Authority (Prieto 2011). This decision has been questioned as it appears to either incentivize further development, or merely generate more revenue for the government. While in 2013 an additional amendment established a transition towards "non-conventional renewable" energies, not including large hydropower, this transition has not been realistically implemented (OECD 2014). The stagnancy is notable in Chile's submission to the 2015 Paris Climate Conference, which relies upon hydropower production for the renewable energy portion of their portfolio (Chilean Government 2015). Rocio Gonzalez, Executive Director of the Futaleufú Riverkeeper,¹⁴ explains that through the proposal's vague wording, "if you read carefully...they said 70% of the energy Chile will produce from now until 2030 or 2050 will be renewables, but they are considering hydropower

¹⁴ Rocio Gonzalez is the Executive Director of the Futaleufú Riverkeeper which operates in partnership with Waterkeeper Alliance.

as renewable." Despite the various environmentally focused amendments, the Code's original model has not been altered (OCED 2014).

This model is the platform upon which a select group of actors and multinational corporations continue to trade and utilize Chilean rivers with little room for governmental regulation. "This hypothesis is strengthened by the way that other possible uses for non-consumptive water rights that correspond to in-stream uses (e.g. conservation, navigation, recreation, cultural uses) are discriminated against by explicit legal recognition, as objects of property rights" (Prieto 2012, 135). As such uses are legally estranged from the water resource on which they depend, the institutionalized preference for hydropower over civilian prioritization is evident. While the Water Code has far more intricacies than these basic concepts, it ultimately instilled a preference for hydropower development through the commodification of Chilean rivers, turning them into virtually cost free resource, and promoting a political misevaluation of social connection to river management.

Environmental Law and Hydrological Analysis

In addition to the Water Code, environmental legislation also influences hydropower development dynamics. The legitimacy of Chilean environmental law has been questioned regarding the strength of ecological impact regulations and their underlying motivations. The National Commission of the Environment (CONAMA) was created based on the 1994 Environment Law (Johnston 2004). This commission, consisting of the General Secretary of the Presidency and ten other ministries, establishes regulations as the general governing body of environmental policy (Tecklin 2011). Environmental impact assessments (EIA), determined by the System of Environmental Impact Assessment (SEIA), requires only that projects meet existing environmental laws, and does not ask that alternative options are presented within proposals (Tecklin 2011). Assessment approvals, which have a success rate of 90%, are largely discretionary based on the sitting administration due to the prioritized opinion of the presidential ministry within the commission. Responsibilities of overseeing ministries, such as continued monitoring and enforcement of approved plans, are often left with little coordination.

A crucial step in constructing a hydropower project, and gaining EIA approval, is obtaining hydrological data to predict not only MW production, but also potential impacts. While hydrological basin analysis requires a plethora of information and subsequent calculations, accuracy of results is left vulnerable not only to technical limitations and climate variations, but

also to data manifested through biases. For example, MW predictions internally generated by hydro developers. While the legitimacy of such predictions and impact analyses is often contested by groups in opposition of development, it is fair to argue that studies conducted in response are conversely motivated by conservation platforms. Thus, "[r]ecognizing the social influences on scientific findings is clearly important since research agendas are often determined by those with the resources to fund research," and "what data are collected and how they are collected, analyzed, and interpreted are not independent of the social context of research" (Campbell 2009, 91). Motivations directing environmental assessment outcomes are notably complicated by research financing. Rocio Gonzalez emphasizes this dynamic through her view of an ongoing University of Chile study that is funded by the Ministry of Energy. She explains that the study is supposedly being produced to more fully understand Chilean river basins beyond their MW potential. However, "we don't believe in this study...we just feel like they are testing...which territories are more or less prepared for certain projects." Gonzalez goes on to provide examples emphasizing that when areas are asked if organized Mapuche communities are present, this is a tactic gauging how powerful social and legal opposition to a project could become. She justifies this opinion stating that "from our perspective that's what we see...it's clear who is paying...they are expecting certain results from [the university's] study, and obviously there is a tendency of giving them the results that they want to hear." Gonzalez concludes that this type of highly financed study further disadvantages communities attempting to resist hydro projects, as local organizations often do not have the funds to commission or personally conduct research from a non-developer perspective.

Despite contention of hydrological data and impact analyses, EIA approval of hydropower projects is rarely an issue for developers. While river fragmentation induces various ecological implications, both potential and unavoidable impacts are often underwhelmingly represented. Through multiple legal challenges of EIAs "the erosion of the CONAMA's credibility has been notable...thereby fuelling a public perception that regulatory deliberation will not be allowed when it conflicts with projects enjoying high-level political support (Tecklin 2011, 890). Often, projects most blatantly obtaining this political support despite EIA contention, are hydro developments. Gonzalez explains how "ridiculous the laws are [in Chile], and that's the problem, whatever [hydropower developers] do they are not going against a law, they are not

doing anything illegal...so we the community and everywhere else we are vulnerable." Gonzalez's opinion is echoed by many other Chilean citizens.

Energy Hierarchy and Industry Demand

In addition to political and legal factors, the way energy is mobilized and the sources demanding it, help clarify private preference for hydropower. Need for more energy in Chile is a highly promoted concept emanating from its capital, Santiago. While there are accessibility gaps within the country, this promotion connects the dynamics motivating a virtually stagnant Water Code, weak environmental legislation, and motivations guiding hydropower development. While the Water Code turned rivers into commodities, Chile's electric law and largely privatized energy sector further defined their purpose as power generators, solidifying market value and development prioritization (Prieto 2012).

The hierarchy controlling energy entry into Chile's grid system illuminates hydropower's preferential position. Energy produced is connected to one of four grids, Sistema Interconectado Central (SIC) being the predominant line. SIC, depicted in figure 3, supplies approximately 93% of Chilean energy demand from the Los Lagos Region in the south to the Atogagasta Region in the north (Belmar, et al. 2010). The Endesa Interconnected System (SIE) is the majority supplier of SIC. As Mauricio Fierro¹⁵ explains, energy flowing into and through SIC is controlled by the Economic Load Dispatch Center (CDEC), and is first drawn from large hydro generation. If demanded, the following sectors accessed are small hydro, coal and gas, and then alternatives respectively. Importantly, once constructed, hydro production has virtually no operating costs, unlike coal and gas (Prieto 2012). As all energy producers receive the same payment per megawatt hour, keeping the fossil fuel industry in the market allows hydro companies to generate a larger profit margin as they are equally compensated for operating costs. This dynamic has created a political and economic hurdle for non-conventional energy infrastructure in Chile.

¹⁵ Mauricio Fierro is a leader of Geo Austral, a member of Comuna de Llanada Grande, and in 2015 participated as a technician on new water policy being developed in Santiago.



Figure 3. These maps display the SIC system in addition to hydropower plant locations, the light grey squares (GENI 2014).

As energy must flow through a main grid before distribution, locally sustained systems are difficult to establish. Many communities in central and southern Patagonia, Futaleufú for example, occasionally lack sufficient energy in the winter months. Fernando Coronado Pinilla¹⁶ emphasizes his perspective that Chilean citizens are often in need of more energy. However, he furthers this idea explaining that energy sources are diverse and depend on each region's resources, pointing to the illogical nature of drawing all energy to the center rather than more local distribution. Gonzalez explains that Futaleufú could produce all of its required energy through low-impact systems such as micro hydro, solar, and wind. Communities such as Futaleufú are restrained from this ideal however, largely due to the Chilean physical and political energy infrastructure. There is therefore a monopoly not only over the creation of, but also the transportation of energy in Chile, emphasized by Endesas' majority contribution to the SIC line.

While energy demand has indeed grown, the mining sector, which already draws more than 30% of Chilean energy, represents the most notable predicted increase of 45% by 2020 (OECD 2014). Fierro explains that the need for more energy is “like a big mythology...created for mining companies.” In 2015, the Chilean government decided to not incorporate a daylight

¹⁶ Fernando Coronado Pinilla is a counselor of tourism in Futaleufú's municipality.

savings time change. This maneuver is claimed by many citizens to be a political ploy corroborating an overall need for more energy. When asked if he believes Chile needs more energy, Cristobal De Bittencourt¹⁷ responds almost identically to most other interviewees: "[T]hat's what the government is trying to show us, that we are lacking energy, but most of this energy is going to the north to the miners and...to Santiago, and none of the energy stays here, it's being generated here in all of these beautiful rivers and it's all going to miners and major companies, they need energy." The Blue Energy example displays the power of private industry motivations. Pinilla explains that Blue Energy, a Canadian company focused on tidal power generation, proposed a marine turbine project that would have provided 40% of Chile's total energy needs. However, the project was never nationally publicized and quickly disbanded. From this scenario, it seems fair to infer that by securing the need for fossil fuel production in the market, the previously discussed larger profit margin for hydropower is also fortified. Fierro describes the Chilean government as a puppet of more powerful entities, its decisions representing the interests of the mining sector, private hydropower interests, and influential Chilean elites.

Perceptions of Political Power and Trans-Regional Relations

Chile's basic political structure is defined by the sitting president, their cabinet, and a governor for each of the fifteen regions, which in turn has a council. Some Chileans feel that governors and more local municipalities are also selected and ultimately implanted by Santiago. Although the degree to which this occurs is not completely transparent, local systems' lack of deviation from national policy is obvious. While Pinilla corroborates that regions' governors are nominated by Santiago, he emphasizes that although people in small towns reject politics, local governments are indeed chosen by the community. Gonzalez presents an overarching idea that "we have different types of ignorance, but there is a lack of education in Chile in general...you ask anyone and they don't understand how the country is administered, or organized in a political way." While Daniel Rudolph,¹⁸ co-founder of Bochinche Expediciones explains that he does not live in a political world and has never voted, he believes it would be irrelevant if he chose to.

¹⁷ Cristobal De Bittencourt is the head guide of Al Sur Expediciones in Puerto Varas Chile, and has a degree in Ecotourism.

¹⁸ Daniel González Rudolph is the co-founder of Bochinche Expediciones, a whitewater company based in Futaleufú.

Rudolph is not alone in this sentiment, and several factors guide his and others' similar statements.

Trans-regional relations seem to influence levels of political passivity. Pinilla emphasizes that the regions commonly feel autonomous from one another, and would often prefer to make decisions specific to their own resources and objectives, rather than the central government dictating management. The perception that centralized decisions often do not serve the regions' specific needs seems to deter citizen political engagement. Continuing with the idea of centralization, animosity that is often felt towards Santiago, especially in more southern regions, is palpable. This resentment, although varying, is justified in one regard when Gonzales explains her perspective:

"The whole country we feel as if we have been left behind... the important issues for them are the issues in Santiago...people will watch the news and how they dedicate 30 minutes how the traffic has been stopped because they are fixing a pothole, and people [in Futaleufú] have to travel three hours to go to Chaitén...in a section where you can die by falling into the Yelcho lake...but its the media's fault and it's the politicians fault that they create this."

In addition to the infrastructural disparity Gonzales presents, she also emphasizes tendencies of the centralized Chilean media. Fierro and others determine that the media is also largely controlled by one family, and "[w]ho owns and controls the media, and for what purposes, has always been a political issue" (Campbell 2009, 75). The result of this control often leading to selected news coverage, perpetuates negative perceptions of Santiago and thus the government.

Beyond the official system, there are five families in Chile widely regarded as the most powerful. These families have different levels of involvement in industry, particularly mining, the media and legislation. Gonzalez explains that "Chile is governed and controlled by...these big families...you know they have the political power, and also they have big investments in all...of the mining and the power and the electricity companies...obviously they will approve laws that increase their incomes you know, so that is the corruption we are living here." Colbún for example, one of the three largest holders of non-consumptive water rights, is owned by the Matte family or Matte Group (Belmar, et al. 2010). Chilean elite influence does appear to be moving in different directions however, largely through the motivations of younger inheriting generations. Despite these shifts, the historical and ongoing economic goals of many elite powers within Chile's governmental context has seemingly influenced a lack of citizen political involvement.

Many Chilean citizens resonate with the perception that their government is an instrument of the private sector. Proposed corruption in the country is more an accepted reality than a passionate debate, although the level and expanse to which it exists is indeed contested. While political motivations are never completely transparent, the network of influences transpiring between governmental and non-governmental authorities is central to hydropower's presence in Chilean rivers. These dynamics are also a basis on which to decipher strategies guiding social resistances to hydro projects.

Social Resistance Strategies

In light of Chile's privatized water rights, limited environmental legislation, energy hierarchy and industrial demand, political allegiances, and general lack of citizen engagement in governmental decisions, hydro development resistances clearly need more than one strategy to gain and maintain traction. The degree to which national and international publicity and availability of information impacts such traction is contingent on distinctive factors. Various opposition tactics that have been used include, street protests/marches, information promotion through social media, artistic and creative demonstrations, legal court appeals and claims, objections to approved EIAs, externally produced EIAs, involvement of non-governmental organizations (NGOs), political appeals to the economic value of river preservation and tourism potential, arguments for the intrinsic value and rights of 'nature,' appeals to project shareholders/financiers both within Chile and internationally, letter writing, and petitions with collected signatures. Combinations of these tactics have varying degrees of success, their effectiveness dependent on case specific and trans-regional factors which will become evident throughout the following case studies.

Developments

While large hydro development proposals have and are being fought effectively in the far south, projects in central Chile and numerous smaller developments in-between continue to be planned and constructed despite objection. Although many projects are not widely known, perhaps due to omission by centralized media forces, the contrast between committed resistance members and more pervasive citizen passivity in regards to river conservation is notable. Considering this theme as it interconnects with other social, political, economic, and ecological

factors previously determined, I substantiate the connections between these dynamics through five case studies. The patterns and relationships displayed throughout the first four, regarding the Bío Bío, Baker, Pascua, Futaleufú, and Puelo rivers, serve as a base on which I present the fifth case, Maipo, which is analyzed as an accumulation of all previously determined dynamics.

Bío Bío

The Bío Bío River, located in the Pehuenche territory, was one of the first major damming controversies that resulted from Chile's post Water Code water management system, and as such, serves as a relevant example for more current project analyses. Beyond the ecological impacts that occurred through reservoir constructions, this case represents the various legal tactics that were used to gain project approval, despite opposition. Much of this opposition emulated from Mapuche¹⁹ communities, who's legal rights were surpassed by private power. The 1993 Indigenous Peoples Law generally depicts that the Pehuenche, part of the Mapuche people, control their lands. Due to the separation of water and land rights however, the Endesa developments were able to move forward. Although the project generated significant amounts of national and international attention, its approval moved through the legal system relatively quickly despite Pehuenche opposition, violating the previously determined approval hierarchy. "Public protests against the World Bank funding of the Pangué dam were widely covered in the Chilean and international media, and this coverage raised considerable concern among private investors who were brought in following the initial IFC/Endesa financing agreement" (Johnston 2004, 214). Despite these efforts, Endesa began construction as the government emphasized that the country's need for energy superseded indigenous rights. In 1994 the Pangué dam was completed, followed by the Ralco dam in 2004. In addition to impacts upon flora and fauna, these reservoirs and subsequent river fragmentations displaced many Pehuenche communities and flooded ancestral lands (Blaser 2004). When the Bío Bío River surfaces in conversation, heads often bow in reverence. Pinilla describes the damming as a tragedy not only for the displaced communities, but also for the degradation of the area's tourism potential.

While the strength of some Mapuche rights have been besmirched through project approvals like the Ralco and Pangué, the cultural connection to conservation remains a powerful

¹⁹ The Mapuche are an indigenous group situated in south-central Chile and Argentina.

tool. Alejandro Coñuequir,²⁰ an active Mapuche member, explains that the word itself means people of the earth, and "for us, the water is life" (translated by author). Furthermore, "[i]ndigenous communities and organizations in Chile continue appealing to courts, policymakers and government agencies, publicizing their struggles, attempting to preserve traditional systems of productive activity and strengthen community control over water, and protesting state actions that enable Chilean elites and transnational capital to usurp right to water or under indigenous lands" (Carruthers 2001, 303). Coñuequir further explains that in the Curarrehue region, there are around forty planned dams which will destroy surrounding ecosystems and generate desertification. While most Mapuche members he knows oppose these projects, he estimates that approximately 30% in the Curarrehue area do not. However, Coñuequir emphasizes that these people have accepted money from developers and are not actively participating in Mapuche culture.

Although the Ralco and Pangué approvals and construction processes are not explored in detail here,²¹ these dams illuminate relations between political and private powers that sacrificed Chilean ecological and social prosperity in 1994, and continue to jeopardize it. Marisol Coñuequir²² deciphers that although there are laws that protect the Mapuche culture, territories, and economies, because hydro developers come from private companies, the government is not required to intervene. Despite the despondent implication, this idea establishes resistance movements' need for fortified legal strategies to combat hydro developments. The following cases will present the growing maturity of such strategies. Additionally, the rights that Mapuche communities do hold present roadblocks for hydro projects, making Mapuche presence or lack there of important to both developers and their opposition. Thus, both Mapuche cultural connection to conservation and their legal rights, although permeable, are important layers in hydropower resistance. Finally, whitewater rafting companies like Bío Bío Expeditions and others relocated in response to the dams. These companies carried a firsthand understanding of the implications of Chilean hydro development.

²⁰ Alejandro Coñuequir, an active Mapuche member, works at Ruke Trankurra, the family's tourism community which emphasizes Mapuche culture in Curarrehue Chile.

²¹ Please reference (Opaso 2007) (in Spanish) and (Johnston 2004) for more in-depth accounts and analyses of the Bío Bío damming and its relationship with Mapuche rights.

²² Marisol Coñuequir, an active Mapuche member and daughter of Alejandro Coñuequir, also works at Ruke Trankurra in Curarrehue Chile.

Baker and Pascua

The HidroAsyén hydropower proposal,²³ backed by Endesa and Colbún, was officially denied in 2014. HidroAsyén would have included five separate hydro projects in Patagonia's Pascua and Baker river basins and, based on internally generated estimations, produced 2,750 MW of energy or 15-20% of total Chilean energy demand (HidroAysén 2011). While filed complaints targeted the predicted 14,000 acres of flooding, community relocations, deforestation, and the fragmentation of the rivers' flows, the proposal faced intense and sustained social opposition on various fronts (Waterkeeper Alliance 2015). The plan's rejection was a monumental action taken by the Chilean government, most notably displaying the power of opposition finances, international attention, and physical location.

Major financial assistance funneled through the Patagonia Sin Represas²⁴ (Patagonia Without Dams) campaign, backed by the Patagonia Defense Council (CDP), solidified momentum. The CDP is comprised of several people and organizations, including the National Resource Defense Council (NRDC) and Tompkins Conservation. Billboards and local radio announcements traversed Chile while documentaries, such as *Patagonia Rising*,²⁵ and social media voices spread internationally. The campaign hired people to document endangered species in the area, such as the Huemul, a Chilean deer. Lawyers were tasked with adding legal pressure to the approved EIA. Fierro believes that the already expensive infrastructure necessary to connect southern Patagonia to SIC, requiring 2,000 km of cabling, became too costly once local opponents threatened to sabotage the planned cabling and towers. Additionally, protests radiated as far north as Santiago. Peter Hartmann, director of Aysén Filial of the Comité Nacional Pro Defensa de La Fauna y Flora, explained in retrospect that the project denial "opened the door for many social movements and changed the political landscape in Chile" (Hartmann 2014, para. 14). Hartman goes on to emphasize that the HidroAsyén protests were the largest demonstrations in Chile in twenty years. This campaign was also greatly aided by Patagonia's internationally renowned and charismatic landscape.

²³ See (HidroAysén 2011) for HidroAysén's official development plan and platform.

²⁴ See (PatagoniaSinRepresas 2014) for Patagonia Sin Represas' campaign platform and resources.

²⁵ Brian Lilla's *Patagonia Rising* documentary was released during the height of HidroAsyén resistance. For more information and trailers, reference (Patagonia Rising 2011).

The essence of this multifaceted campaign's success was the forced budget increases and prolonged development timeline. Gonzalez explains that Patagonia Sin Represas was able to "dela[y] the project a long time, which ma[de] it more expensive for the company to actually keep on working on it, so in the end it was too expensive because Endesa gets these loans and...investors begin to lose their investment." This is a central point, emphasizing that project investors need to remain satisfied with the developments' fiscal stability in order to continue funding it. Ultimately the project's prolonged timeline, delayed by the previously described resistance strategies, generated these financial issues. The movement's success also displayed not only the power of funded resistance strategies, but also the advantage international and trans-regional support. While the Baker and Pascua rivers remain largely under private control, and thus are subject to continual threat of development, the HidroAysén case redefined the hydropower resistance arena in Chile.

Futaleufú

The Futaleufú River in northern Patagonia has also remained free flowing within Chilean borders, despite Endesa ownership of its non-consumptive rights. Although Endesa had listed the Futaleufú as one of seventeen planned hydropower projects in Chile, like HydroAysén, plans to develop the Futaleufú were curtailed in 2014. While the proposal captured both local and international attention, effective resistance was developed through several means including the Futaleufú community's previously established knowledge of hydro development. As several whitewater rafting companies and guides relocated to Futaleufú from the dammed Bío Bío, this migration not only brought a strong outdoor industry presence to the area, but also an understanding of hydropower connotations and the level of defense needed to combat development.

Although the whitewater industry has promoted river conservation in Futaleufú, dynamics with local community members have not always been fluid. Gonzalez depicts the underlying tensions stating "at first these companies didn't have a good connection with the community so they 'will bring their tourists, they will keep them in their own camps outside, they will go down the river, and then they will leave,' so the tourists didn't even come to town to buy bread...so for people at first tourism...wasn't something that would benefit them." As the industry started gaining momentum in Futaleufú, more Chilean guides and companies immersed

in combination with other businesses needed to support increased tourism. This transition, although still in flux, promoted more pervasive community involvement with the whitewater industry through economic benefit.

Futaleufú's more extensive history of conservation is also displayed through their ZOIT application, which was approved by Los Lagos Regional Secretariat of the Ministry of Economy. ZOIT is a Chilean development program directed towards combining the forces of sustainable tourism industries and local community leaders. Futaleufú's ZOIT certification now protects 131 square miles of the region, although the water rights remain under Endesa (OECD, 2014). As the watershed is surrounded by national parks, and government funding has gone into promoting eco-tourism, the river's solidified conservation would be a logical transition. However, there are still many concerns that Endesa's proposal will regain momentum, or that the water rights will be traded to another aggressive corporation.

In light of these threats, the Futaleufú Riverkeeper²⁶ utilizes diligent legal strategies. For example, Gonzalez and other members of the Riverkeeper team responded with legal action when Endesa applied to change the geographical coordinates of the project's construction site in August 2015. While this change was not large, the Riverkeeper filed thirty-seven legal opposition requests to the Dirección General de Aguas (General Directorate of Water) (DGA). While Gonzalez recognizes that "[Endesa] already [has] the rights, they could build the dam today," she emphasizes that "we are aware, we are watching [Endesa], they move a finger and we will move 37 fingers." As these claims will move through the court system in a pattern of appeals, this tactic also produces increased publicity and awareness. Additionally, she emphasizes "that's what lawyers do, they delay process, and we are going to use that same tool so they get tired and don't have money to do it in the future." Pinilla deepens this idea explaining that beyond the economic cost of actually constructing a project, developers face a social cost or funding they use to mitigate and combat opposition tactics. Ultimately, if social costs are raised high enough, development feasibility crashes, like that of the HidroAsyén.

In considering these costs, legal strategies, and current conservation initiatives surrounding Futaleufú, social dynamics remain a concern. Although relationships between more traditional locals and whitewater industry members have improved to varying degrees, those who

²⁶ The Futaleufú Riverkeeper is a subset of Waterkeeper Alliance, an international NGO. For more information, please reference (Waterkeeper Alliance 2015).

participate in conservation movements in Futaleufú are still largely "outsiders." Gonzalez reiterates "I don't think its because [locals] don't care, I think it's because they have different priorities." On January 11, 2016, there was a public meeting held that focused on Futaleufú River conservation and relations between local municipalities. Regarding Gonzalez's point, kayakers at Patagonia Elements, another whitewater company in Futaleufú, explained that most people who attended this meeting were guides, and the majority of those guides were foreigners. This struggle to include more locals in river conservation initiatives has been a key issue for hydro resistance movements in Futaleufú and beyond. Despite these underlying dynamics, Futaleufú's conservation platform is substantial and growing.

Puelo

The Puelo project, a Mediterráneo S.A. development,²⁷ was approved by the Chilean government in November 2015. This 210 MW run-of-river hydropower project would extract the majority of the Manso River's waters at the confluence of the Torrentoso River before re-entering the Puelo Basin. Like the Bío Bío damming, HidroAsyén and Futaleufú proposals, and others, this decision has sparked resistance emulating from local grassroots movements, Mapuche communities, the outdoor industry, NGOs, Chilean entertainment personalities, and other stakeholders. The Puelo project emphasizes the continuation of core issues within the Water Code and environmental legislation, while allegations rise regarding Chilean political allegiances to project financiers. The Puelo situation, as it is so recent, is an opportunity to not only determine what type of strategies currently can build enough traction to push a project towards rejection, but also to speculate as to what factors influence the level of international attention.

Legally, actual construction of the project has faced difficulties on at least two fronts. Beyond the twenty-seven filed and then rejected claims, Mapuche communities have opposed the project based on violations of indigenous rights depicted in Chilean law, specifically the application of the ILO Convention 169.²⁸ Additionally, when an ecologically destructive road was discovered along the Manso River, more opposition was solidified. Fierro explains that

²⁷ For Mediterráneo's official Central de Pasada platform, please reference (Mediterráneo 2016).

²⁸ For a comprehensive depiction of the Mapuche presence in Chile, their legal rights and dynamics involving the ILO Convention 169, refer to (Culliney 2013).

“Mediterráneo created a road directly to the point to get the water...and destroyed this big area with no permission, no license, no nothing, totally hiding, and the excuse of Mediterraneo is ‘it's not my property, the property is the other guy it's not my property,’ but who is this guy? - the owner of Mediterraneo.” This road’s discovery and publicity has slowed the project’s momentum. Generalizing from this example, Fierro adds that corporations operating in Chile often fragment their activities by using other companies and different names to avoid associations. One such association, among others, is Ricardo Bachelet Artigues, a partner in the development and also the current president's cousin (Fierro 2014).

Beyond the resistance movement’s legal strategies, which have gained traction despite lack of funding, I find the following dynamics to be the most prudent in analyzing the Puelo resistance movement. The Puelo River Basin is also in northern Patagonia, but unlike Futaleufú, which established a hydropower knowledge base in the 90s, has been relatively recently introduced to conservation dynamics. While tourism has grown in the Puelo basin, Mediterraneo’s momentum stimulated an increase in its promotion, specifically outdoor industry development. Furthermore, as the Puelo is located near the southern end of SIC, relative to other major rivers further south, the energy transportation infrastructure is more feasible both physically and financially. However, opposition demonstrations have been highly publicized, such as the one in March 2014 that was lead by Mujeres Sin Fronteras (Women Without Borders).²⁹ This march consisted of protestors on horseback, riding north from the Puelo Basin towards Puerto Montt. The attention resistance strategies have been able to bring to the Puelo development may be significantly aided due to its northern Patagonia location. Continued publicity combined with current legal strategies could generate a substantial increase in the project's timeline, and budget. While opposition strategies have been impactful, the project maintains powerful benefactors. Fierro emphasizes Endesa's plan to utilize their non-consumptive water rights of the Puelo River if Mediterraneo’s Manso River development is successful. The approved Puelo project is ultimately another example of the relationships between Chilean political and private motivations, hindering improvements to environmental legislation and equitable water management.

²⁹ Mujeres Sin Fronteras is a Chilean environmental organization. For more information, pictures, and videos of the group’s march, please reference (The Clinic 2014).

Maipo

The Maipo River runs through Cajon del Maipo, Comuna de San José, located about thirty miles southeast of Santiago. The Maipo basin is currently being developed despite the contested EIA and unscrupulous National Forest Corporation (CONAF)³⁰ approval of the Alto Maipo run-of-river project. Official project proposals started in 2007 and met local opposition (Orrego 2014). Analysis of the invasive tunneling system pointed to impacts beyond what the approved EIA depicted. Lack of total community resistance to Alto Maipo is apparent however, in addition to relatively less trans-regional and international support compared to the Bío Bío, HidroAsyén, Futaleufú, and Puelo cases. While various strategies are being utilized to curtail the projects' forward momentum, influencing both Chilean and international investors, formally involved and not, is an arduous process. The Alto Maipo development is an accumulation of the convolutions of Chilean water rights allocation, political financial allegiances, weak environmental standards, trans-regional social dynamics, and local cultural obligations.

Project Details

Alto Maipo³¹ is being constructed by American AES Gener and the Luksic Group, one of Chile's wealthiest firms and families. If completed, the development would capture the majority of Maipo's water through its main tributaries, the Volcán, Yeso, and Colorado, and include two underground power plants called Alfafal II and Las Lajas Colorado (Salvemos el Río Maipo 2015). The development is currently co-financed by the International Finance Corporation of the World Bank, U.S. Overseas Private Investment Corporation, and six commercial banks, now totaling in over \$2 billion dollars (AES Gener 2015). As of 2012, there were at least four different groups contracted for construction, which included Austrian, German, and Italian companies (Kenyon 2012). The developers anticipate completing the system in 2018, and mining operations in the valley have been predicted to follow. Despite ongoing construction, organizations such as Red Metropolitana No Alto Maipo, Coordinadora Ciudadana Ríos del Maipo, Ecosistemas, and Observatorio Latinoamericano de Conflictos Ambientales have emphasized the plan's social, economic, political, and ecological misrepresented and undervalued impacts, as they work to gain exposure and ultimately halt the development.

³⁰ CONOF is an organization overseen and funded by the Ministry of Agriculture of Chile through which the government manages their forest resources. For more information, please see (Conaf 2016).

³¹ For AES Gener's depiction of their Alto Maipo project, reference (AES Gener 2015).



Figure 4. This map displays the planned Alto Maipo run-of-river system, the tunnels depicted by the red dotted line and towns including San José de Maipo in black (Codoceo 2012).

Energy Contention

While Alto Maipo proponents estimate that the two plants would generate 530 MW of energy, other externally produced estimations, accounting for climate variation and drought conditions, approximate only 160 MW (Salvemos el Río Maipo 2015). Anthony Prior³² explains that it would take many more projects to reach the MW capacity the developers are proposing. The Luksic groups' Los Pelambres copper mine would be the main recipient of Alto Maipo's energy (Escribano 2015). Unlike projects in the more southern regions, the energy transportation infrastructure and connection to SIC and the mine would be relatively simple. Furthermore, some community members in San José suggested that generated energy would not only flow to the growing mining sector, but also be exported to Argentina. Prior emphasizes Argentinian involvement, explaining that "the proof of this is that the same company years after project testing Alto Maipo, requested permission from the government to be able to export energy to Argentina through SIC" (translated by author).

Powerful Investors

The main developers, American AES Gener and the Luksic group, are two of the most well-known names in Chile. AES Gener is one of the three largest holders of non-consumptive

³² Anthony Prior is a leading member of the No Alto Maipo movement.

water rights in Chile. Pinilla describes the Luksic group as the largest and most powerful family in the country. Maria Isabel Navarrete Ortega,³³ a leader of Mujeres Sin Fronteras, supports this notion explaining that she doubts the resistance movement will be successful because "what is happening with Alto Maipo is Luksic, and Luksic is the president of Chile, not Bachelet" (translated by author). In addition to these economic and thus political powers, Prior reiterates the point that although there is a vote it does not actually provide any leverage for the community's opinions. From Fierro's point of view, "it's necessary to inform [a project] to the local community, with a process, the name this process is Participacion Ciudadana, or citizen participation, but this participation is not linked with the decision, it's like psychology therapy for the people, thank you for your opinion but the decision is totally different, it's politics." Prior adds that the developers offer promises of work and money as their form of communication. This is clear in the town square's weekend market. Many booths are sheltered by blue tents that read "Alto Maipo, AES Gener." When asked about the tents, local vendors explain they were presents.

Ecological Impacts

Ecological concerns have been raised on several fronts regarding Alto Maipo's construction, including potable water degradation. Chile's capital Santiago holds 40% its 17 million people and relies upon the Maipo as its main source of drinking water. The run-of-river system jeopardizes this potable water source which supports the majority of people in Greater Santiago (Belmar, et al. 2010). The President of the Environmental Department of Colegio Médico de Chile, Andrei Tchernitchin M.D., presented a report this year which analyzed the current water quality of Volcán. The analysis indicated that there are now significant levels of arsenic, lead, manganese, and other toxic compounds. These levels are beyond what the World Health Organization deems acceptable (Reiquelme 2016). The report emphasizes that these levels are a product of the Alto Maipo construction, and impacts upon the groundwater are virtually irreversible. Currently there is no Chilean legislation that prioritizes the quality of drinking water over other uses (OECD 2014). Furthermore, Greater Santiago's water supplier, Aguas Andinas, is controlled by a Spanish company, Sociedad General de Aguas de Barcelona

³³ Maria Isabel Navarrete Ortega is a leader of Mujeres Sin Fronteras.

S.A. (Agbar) (Aguas Andinas 2016). Aguas Andinas' economic relationship with Alto Maipo and its developers has been a growing source of contention.

In addition to contamination concerns, Alto Maipo's opposition emphasizes oversights within the approved EIA.³⁴ The EIA did not consider, for example, that "the 70 kilometer tunnel will also cross under the Natural Monument El Morado and the Lagunillas Sanctuary, part of the National System of Protected Areas of the State (SNASPE), putting at risk the San Francisco glacier and lagoon, and the high plains and wetlands, the base of the local shepherd and peasant economy" (Belmar, et al. 2010, 44). Furthermore, the Andean Condor and Puma, both endangered species, have have been exponentially threatened by the projects' ongoing alterations to the valley's ecological regimes. The No Alto Maipo movement has also presented concerns that the development will cause desertification throughout 100,000 hectares of the valley (Escribano, 2015). Beyond the EIA created by developers, "political authorities of the Bachelet Administration, particularly the Minister of the Internal Affairs, Edmundo Perez Yoma, and the Minister of Energy, Marcelo Tokman, supported the Alto Maipo project before its environmental assessment was finished; evidencing the lack of independence of the Environmental Evaluation System," once again brining into question political allegiances and establishing the weakness of Chilean environmental legislation (Belmar, et al. 2010, 55).

Cultural Conservation Dynamics and Santiago Proximity

Prior raises an important point that many Chileans portray notions of "not in my house" or "not in my backyard" (translated by author). While these phrases may first conjure the idea of passionate defense, Prior emphasizes that while fervent opposition may develop for those directly affected by a hydro project, for many physically removed from the impact zone, the fight does not carry through. Bittencourt reiterates this idea explaining that generally Chileans "don't really realize what is going on until they come to your place, there are so many people that don't really care or fight against other [projects] but when they come to yours and try to do something...then you really realize what's going on." Furthermore, Marisol Coñuequir emphasizes the lack of Mapuche presence in Cajon del Maipo. She explains that that "they are Chileans, they are only able to defend an environmental theme, but the Mapuches defend the environment, the culture, and the culture is stronger" (translated by author). While citizen

³⁴ For AES Gener's official EIA, please reference (Martin 2008).

passivity regarding environmental dilemmas is an issue for most hydro resistance movements, the No Alto Maipo campaign faces additional social complexities.

While San José de Maipo is a completely separate entity from Santiago, its close proximity to the capital is one that seems to both help and hinder the No Alto Maipo movement. Hydro resistances in regions further removed from Santiago often align with the notion that "environmental problems in the periphery...are associated or intertwined with the populations of the core" (Barbosa 2009, 37). As the Maipo development is as an "environmental problem" near centralized Santiago, underlying social dynamics are important to consider. On one hand, animosity often directed towards Santiago combined with the river's proximity to the capital does seem to perpetuate less trans-regional support for the No Alto Maipo movement. Despite this dynamic, Maipo's location does aid resistance tactics in some regards. For the Greater Santiago population, San José is a common retreat for weekends and holidays, reinforcing a dependence on the area's prosperity. Furthermore, as both Chile's population and media coverage is centered in Santiago, No Alto Maipo's sizeable protests are not only fortified by Santiago residents, but are also publicized through the more accessible media outlets. Although Chilean environmental groups outside of the Maipo area have become involved, effective international themes such as 'Patagonia Sin Represas' used for the HidroAysén movement, that also transitioned to a 'Futaleufú Sin Represas' slogan, seem to have lost momentum as far north as the Maipo. While the recent Futaleufú and HidroAysén proposals attracted powerful international attention, perhaps due to their location in the idyllic Patagonian landscape, the Maipo has not received as much consideration despite sustained local outcry. These dynamics are in flux however, and trans-regional hydro resistance coordination and support is indeed growing.

Ongoing Resistance Techniques and Tourism

Regarding legal opposition, in 2015 several members of No Alto Maipo, including Pablo Orrego, president of Ecosistemas and recipient of the Goldman Environmental Prize, travelled to Washington, D.C., U.S. to educate the project's investors. "The delegation met with representatives of the Inter-American Development Bank (IDB), Overseas Private Investment Corporation (OPIC) and the International Financial Corporation (IFC) from the World Bank... point[ing] out the technical irregularities of the project to the financiers, including the lack of hydrogeological and sedimentation studies, which is in violation of International Financial

Institutions (IFI) standards" (Escribano 2015, para. 7). At that time No Alto Maipo also displayed intentions of informing the project's European financiers. While the Alto Maipo's budget and timeline has increased from the original proposal's estimates, its funding endures. Additional ongoing resistance strategies include large protests, signed petitions, concerts, social media updates, Cajón del Maipo tourism promotion, and EIA contentions based on current contamination analyses.

Also in 2015, the Maipo Adaptation Plan (MAPA) was created in response to growing impact concerns from both the Alto Maipo construction and overarching climate variations. This plan "has formed a collaborative science-society platform to generate insights into the vulnerabilities, challenges and possible mitigation measures that would be necessary to deal with the potential changes in the M.R." (Melgar 2015, 1). The collaboration consists of approximately 30 different stakeholder groups, both public and private, local, and regional. The subsequent "Robust Decision Making Framework" provides a comprehensive identification of vulnerabilities and mitigation plans for potential long-term scenarios in the Maipo basin (Melgar 2015). However, the realistic application of such measures does not seem possible without a substantial shift to political accountability and dedication to social and ecological prosperity. Emphasizing the need for such a shift, the Superintendent of the Environment, Cristián Franz, appointed by Bachelet, has been repeatedly accused of "systematically refusing to meet with social organizations that inhabit the area of Cajon del Maipo" (translated by author) (Riquelme 2016, para. 13).

Despite the previously mentioned absence of official Mapuche communities in the Maipo basin, strong relationships with river conservation prevail. One connection that has grown significantly in Maipo is the boating culture, displayed through several whitewater companies in the community. Many of the Maipo guides and kayakers travel throughout Chile and the world, inherently generating more trans-regional communication both within and outside of the boating community. While their dependence on preserving the Maipo's flow is strong, the whitewater tourism industry has yet to generate enough economic influence, relative to the project investors' financial pull, to impact Alto Maipo's fate. In the Alto Maipo EIA, AES Gener recognizes a decline in tourism due to their project, but ensures that the impact will be minimal (Martin 2008). San José de Maipo appears to be increasingly tourism dependent however, as it incorporates more hostels, lodges, and restaurants to account for both national and international visitors.

While the fight to halt or significantly compromise upon the Alto Maipo project is far from over, resistance is indeed inhibited by the influences of powerful developers, mining industry investment, sparse opposition funding, trans-regional disinterest as a consequence of proximity to Santiago, overall environmental passivity translated through the historical lack of citizen political influence, limited environmental legislation, and as always, the Water Code. Despite these hindrances, obligations to river conservation such as those displayed by the Maipo boating community, Santiago tourism, and other community members, have sustained No Alto Maipo momentum and media traction. In regards to Chilean elite power, motivations behind their influence has seen shifts especially in inheriting generations. Many members of the Asotrga family, for example, have played large roles in the resistance of Alto Maipo. While Alto Maipo's opposition has displayed both dedication and strategic adaptation for nearly a decade, whether or not the resistance will be able to increase the social cost of development to outweigh private economic benefit, currently appears debatable. However, as Alto Maipo resistance has a heightened ability to capture Chilean media attention, the movement generates more pervasive citizen awareness of hydro developments in Chile and in turn promotes the need for policy reform. Through such an advantage, the Maipo case not only has the potential to transcend unfavorable Santiago associations through trans-regional river preservation connections, but also to challenge the institutionalized preference for hydropower.

Resistance Strategy Inferences

These five cases expose the ongoing implications of Chile's neoliberal transition and resulting privatized water management system, weak environmental legislation, and institutionalized preference for hydropower development. The Chilean government's sacrifices of social and ecological prosperity are interwoven within these layers and illuminated by the above resistance movements. Rocio Gonzalez distills the overarching situation: "We are at a disadvantage in this whole fight, huge disadvantage...we are fighting...the private companies with a shitload of money, and the government who has a shitload of power, and then we are here trying to do something, so it's crazy." In light of these David and Goliath circumstances, establishing effective strategies is paramount for river preservation. Although the determining factors for effectiveness are based on nuanced social, political, ecological, and economic concepts, they are comparable between some developments. Accounting for Chile's currently

stagnant policies, environmental and otherwise, demanding and receiving governmental intervention for controversial development is uncommon and must not be relied upon. Therefore, resistance strategies ultimately center on demolishing a developments' financial security by targeting project investors, often indirectly. As the cases above depict, specific strategies needed to compromise a project's funding vary based on river location, local dependence on flow preservation, legal exploitation, international attention, level of trans-regional support, and sustained momentum. While these tactics have been analyzed in terms of large-scale development, I will now emphasize that hydropower impacts in Chile reach further than many realize.

Small-Scale Development

Relative to large-scale developments in Chile, smaller projects receive little to no national attention. Matias Beltran,³⁵ lead guide of Ko'kayak whitewater adventure tours, explains that this lack of attention is exacerbated by developers who attempt to limit project information to locals who are in closest proximity to the construction site. "The Río Blanco" for example, is "a little river, only the people near there knows there is a dam. We only know because we work in tourism, but no one else is aware, and that happens in all of Chile" (translated by author). This pattern is important to consider as many rivers are left undefended not only due to environmental passivity, but also through lack of means to draw attention. Furthermore, in an attempt to supersede community backlash, hydro developers commonly offer unofficial payments to landowners most consequential to a project's construction. This dynamic exacerbates the already notable attention deficit many smaller rivers face. Bittencourt explains that "people who live close to the river are being influenced with money from these companies, like 'don't fight against it, keep it quiet, and let us do our thing,' right next to the river." When Bittencourt and other kayakers went to paddle Rio Bonito in 2014, they found a dam on Google Maps before leaving. The group then identified and called the landowner, who terminated the conservation when Bittencourt mentioned the dam. After seeing the site, Bittencourt explains that "more than 50% [of the water] went in pipes, and then they returned it to the river, but it's really really ugly...I think we were the first people to discover this thing because all the kayak books and

³⁵ Matias Beltran is a leader of Ko'kayak Whitewater Adventure Tours, based in Puerto Varas.

guides said there was a river there, but once we got there we realized it was really new, this dam." Besides a small post written on *riversofchile.org* regarding this discovery and explaining there is only enough water to paddle after significant rain events, there is little information beyond local recounts (Josey 2014). Bittencourt, Beltran, and others emphasize that this is the pattern in Chile. Other rivers rumored to be or are already incorporated in hydro development plans are the Cuervo, Rocín, Cortaderal, Las Leñas, Blanco, Cautín, and Ñuble. While this list includes both small and large-scale projects, it is important to note that the real number of rivers facing development is far greater than what is made obvious.

Political Reform

In addition to these non-transparent developer tactics, the Chilean government's apparent contradiction against itself in terms of national image and tourism promotion further complicates hydro's presence in Chile. According to Gonzalez "if you calculate how much investment the government has done in [Futaleufú] in tourism, it's huge, so if they allowed a dam to be built in the river, they are destroying their own investment...They want both things, they want to look good but they want money." This illogicality is an important consideration for resistance movements, as increased international attention upon a hydro development has the potential to apply enough political pressure to outweigh economic motivations. However, in light of dilemmas such as project information containment, lack of trans-regional support, and a common deficiency in opposition funding, it is difficult to perceive how Chile's international image could be jeopardized to this point continually, especially as internally its citizens are not united in hydro resistance. Furthermore, as the Chilean administration and thus all regional governments change every four years, developing cohesive and long-term policy adaptation is difficult. Thus, effectiveness of social resistance to river development and broader challenges to policy ultimately relies upon sustained local momentum. Fierro depicts this idea in reference to attaining developers' attention: "It's better to start with something on a local level, it's like a small stone in your shoe, now you don't care, but maybe one week, or one month, you feel totally destroyed with a small stone...it's growing." While this strategy provides opportunity for river conservation movements in Chile to "create a forum for social change," it is clear that such change's impact upon hydro development would be less consequential without simulations political reform (Carruthers 2001, 1). Although the sitting president Michelle Bachelet has made

more environmentally focused reform proposals between her two terms than any other president, their implementation has been unimpressive.



Figure 5. I took this picture in January 2016 on Chile's main highway, Route 5. The billboard reads: "Reform the Water Code, Expropriation of Our Waters, Corruption" and was the only major sign I saw referencing water conflict in Chile.

While Bachelet has defined several modifications to the Water Code and the constitution itself in terms of promoting both water as a "national good" and the ecological stability of Chile's basins, these goals continue to be unrepresented. Ideally, "the purpose of this State public responsibility requires the recovery of the legal status of water as a national public good...belonging to all Chileans, and cannot be given as property to private hands, free of charge, in perpetuity, and without criteria that prioritize the needs of the population and the maintenance of environmental owes to ensure the integrity and functioning of watersheds" (Belmar, et al. 2010, 31). In 2007 the Bachelet administration did make what appeared to be concerted efforts to mitigate water conflicts in considering new management strategies. However, like other initiatives the "Integrated Watershed Strategy" and following Interministerial Water Committee lacked clearly defined alterations and capabilities to adapt to basin specific dynamics (Belmar, et al. 2010). Also during Bachelet's first term, a specific reform called "Draft Law on Constitutional Reform to Article 19 No. 23 and 24" presented by the Ministry of Public Works in 2009, "took into account the parliamentary proposals and citizen demands that focused on the objective of allowing more equitable access and distribution of water; on giving priority to the multiple uses of it; on promoting the implementation of water reserves from rivers; and on preserving watersheds and the social, economic and environmental services that water and watersheds provide to communities and local and national development" (Belmar, et al. 2010,

27). As Piñera took office in 2010 however, the reform was frozen and has not been remobilized despite Bachelet's return to office in 2014. Ultimately her water policy goals remain vague as do her allegiances to projects like the Puelo, making the transition to the legal management of water as a "public good" currently improbable. This statement is generalized through the notion that "environmental policymaking has been driven primarily by external forces linked to economic globalization rather than by the kind of internal societal and political changes commonly identified as drivers of environmental policy" (Tecklin 2011, 880).

Responsibility and Forward Momentum

Although many Chileans are not physically affected by hydro projects, the common lack of awareness for those outside of development impact zones can be partially attributed to a pattern of environmental passivity. However, this pattern is exacerbated not only by a government system where fundamental change largely appears futile to its citizens, but also by a national media sector which promotes the centralized voice alienating vast portions of the country. Furthermore, the animosity often felt between the rest of Chile and Santiago moves to abandon the remaining free flowing rivers to private interests that are often connected to transnational entities. Gonzalez presents a historical perspective:

“During the military government a lot of people thought everything was okay too, there were a lot of things that were hidden...Usually people don’t realize the power they have, and they don’t want to realize the power they have, because that means responsibility. So all the things we knew after the military government, we knew them afterwards, and now it's more like a general conception that it was horrible, but during that time not a lot of people knew, or they didn’t want to know, and now I think it's the same thing. There are a lot of things that people don't make connections to because they would rather just live their life.”

Despite this acquired passivity, there are those who have accepted the responsibility of awareness and continue to fight the uphill battle. As we have seen with the Baker, Pascua and Futaleufú rivers, there are victories to be had. Whether or not the Maipo, Puelo, and other rivers will also prevail has yet to be seen.

One factor that could play a larger role in determining these rivers’ fates is the Chilean whitewater industry. Although whitewater companies historically incorporated many foreigners, in places like Futaleufú, Pucón, Puerto Varas, and Maipo, Chilean boaters have stepped to the forefront. While underlying tensions between the whitewater industry and communities such as

Futaleufú appear to hold back some of its social influence and thus political momentum, there are more examples to the contrary. Marisol Coñuequir emphasized Puesco Fest, a river festival centered around Pucòn, one of the most famous river towns in Chile. Although the festival has only been around for the past few years, it already draws more than 6,000 people bringing in kayakers from different regions in Chile and the world. Conuequir adds that kayakers want to see the rivers free and clean, and so do the Mapuche, displaying a common cultural bond to river conservation. Ortega also emphasizes that the kayakers bring life to the river and allow younger generations to become involved. In 2009, both the Petrohué and Cochamó rivers' water rights were solidified under local municipality's management through the DGA (Belmar, et al. 2010). Pinilla emphasized that this was done in the name of tourism and conservation. While this case is rare, the fact that it happened at all emphasizes that renationalization of water rights in Chile is possible, if only on a local scale, especially with the economic incentive of whitewater.

Broader Implications

"Water is a basic means of mobilizing people" (Boelens 2013, 234). While this statement has been proven true in Chilean basins and countless others throughout the world, the effectiveness of such social momentum is complicated. Hydropower has become more than a technical system through which to harness kinetic energy. It is now so deeply intertwined with larger political, economic, social and ecological contexts that the impacts it generates must be mitigated in an equally multifaceted manner. More over, those who have the political authority to manage such dilemmas must be held under scrutiny as the communities they govern struggle in finding effective means to combat financial allegiances to, and institutionalized preferences for, river development. Ultimately, Chile's and many other countries' peoples and rivers have been abandoned by their political systems, and left vulnerable to private interests masquerading as "renewable" energy while simultaneously exploiting profit margins.

International Guidelines and Implementation

Social and ecological dilemmas generated by hydropower development and perpetuated by political and economic contexts are not new concepts. These implications have all been heavily considered and analyzed on international, national, and occasionally project specific

scales. While several organizations have proposed solutions, some exclusively created to develop mitigation guidelines, their implementation is underwhelming. In considering some of the guidelines for hydropower development that have been presented in the past two decades, it is clear that in the case of privatized water management systems, such as Chile's, these guidelines are ineffective as there is no political motivation nor accountability for their implementation.

The World Commission on Dams (WCD) was created in 1997 by the World Bank and World Conservation Union. The group disbanded in 2001 after generating a report that focused upon increasing resistance to dam developments. The Commission's report presented global guidelines for dam development, considering ecological, social, and economic impacts, while accounting for perspectives within the private, academic, and political sectors (United National Environment Programme Dams and Development Project 2000). As the report explains, "unlike every other aspect of our lives, large dams have long escaped deep and clear and impartial scrutiny into the process by which they emerge and are valued" (United National Environment Programme Dams and Development Project 2000, ii). WCD guidelines notably promote the necessity for open and clear communication regarding proposed development goals before specific project plans may ensue. Additionally, in explaining requirements for both comprehensive and accountable project impact assessments, the Commission emphasized the need for public acceptance. Informed consent must be freely obtained from all potentially affected communities. Transboundary basins must also inform and compromise effectively with downstream nations in terms of river development. Ecological assessments should decipher basin-wide impacts and account for threatened and endangered species habitat alterations. Guaranteed flow releases which would sustain downstream ecosystems based off of scientific data collection are necessary. Furthermore, those most directly impacted by project infrastructure should receive benefits beyond the compensation provided for all financial losses or displacements costs. Importantly, all agreements must be legally enforceable and mechanisms to review and ensure compliance of such agreements are necessary.

More recently the International Hydropower Association (IHA) developed the Hydropower Sustainability Assessment Protocol in 2010. This protocol claims not to "attempt to duplicate or re-write the WCD outcomes," but acts as "a cross-sector collaboration looking at an existing performance measurement tool and proposing enhancements" (International Hydropower Association 2010, under "How was the Protocol created?"). This protocol is an

assemblage of general "sustainable topics" behind hydropower development, with a notable lack of emphasis on social acceptance of projects themselves.

In 2015, the Nature Conservancy produced *The Power of Rivers*, a report which analyzed three separate hydro projects for the purpose of depicting what a more balanced hydropower future should entail. While their guidelines follow similar trajectories as the WCD's and IHA's, they explain that funding more responsible projects will be significantly more expensive. The Conservancy identifies that "[s]eventy percent of all planned hydropower investment is projected to occur in river basins where development would threaten basin-scale connectivity" (Opperman 2015, under "Funding better outcomes"). The Conservancy's Hydropower by Design concept, which would largely avoid such basins, minimizing and mitigating any unavoidable impacts, would add "an additional global cost of approximately US\$3 billion per year over business-as-usual approaches between now and 2040" (Opperman 2015, "Funding better outcomes"). While the study emphasizes that the economic values of healthily functioning basins and integrated water management will ultimately promote funding for Hydropower by Design, this has yet to become a pattern.

While these guidelines and others promote logical and necessary considerations for hydro development, enforceable implementation has rarely been taken into effect. Hydropower continues to move forward most notably disregarding guidelines which require externally founded ecological assessments and community approval. While these reports focus on large-scale dam projects, smaller scale dams and run-of-river projects also continue to be constructed without sufficient consideration. Moving forward in light of largely unenforceable yet vital guidelines, hydro resistances must identify and utilize mechanisms that apply sufficient political pressure to demand their implementation.

Tourism Influences

One such mechanism is the tourism industry. Whitewater tourism specifically presents opportunities for not only environmental education and social connection to river preservation, but also for economic incentive. Tourism is considered to be the world's largest industry and generated US \$852 billion in 2009 (World Tourism Organization, 2010). Like many nations, Chilean tourism has yet to reach its potential, and nationally speaking does not have an influential economic presence. However, Bittencourt emphasizes that "development for me now

is conservationism and tourism...different type of development, we have the chance to have that still even if we have dams and projects on some rivers, we still have so many other rivers.” This sentiment, expressed by many river communities, seems to be largely powered by the river guide and kayaker culture. Expanding this idea to groups less directly related to river conservation may generate enough social pressure to influence policy change. Furthermore, as the end goal of free flowing and healthy rivers is one that many can agree on, the economic benefits and cultural influences of whitewater also have the potential to curtail environmental passivity. Broadly speaking, hydropower developments have altered an impressive amount of South American basins. Similar to the previously mentioned Puesco Fest, the Jondachi Fest in 2015 collected both Ecuadorian and international kayakers in defense of Ecuador’s Jondachi River, which is under threat of development. Matt Terry, founder of the Ecuadorian River Institute reflected: "We need to make a collective effort to establish an international wild & scenic river protection program³⁶ to preserve strategic whitewater resources around the globe. We also need to be seen actively using these resources...Bring some friends and be sure to let the local population know their whitewater river resources are important and worth saving" (Terry 2016, para. 17). These ideas of visible whitewater recreation and cultural momentum, including groups beyond boaters, are important in promoting river conservation’s political traction.

Conclusion

Without water humanity would not survive, yet the way it is continuously undervalued on an economically determined scale, discounting social and ecological requirements, has created fundamental imbalances. These imbalances have given private interests the ability to expand profit margins of rivers, while degrading the health and integrity of the communities and ecosystems through which they flow. There have been extensive analyses of Chile's and other countries’ relationships with hydropower, proposals have been made, and yet they continue on the all too familiar trajectory as other hydropower dependent nations, such as Spain, India, China, Brazil, the U.S., and Canada. The hydropower problem further compounds as social attention spans, on local, regional, national, and global levels, are quick to move beyond such

³⁶ For more information on the Wild and Scenic System, enacted in the U.S. in 1968, please reference (National Wild and Scenic Rivers System 2016). Chilean and many other nations’ rivers could greatly benefit from a legally binding conservation program such as this.

complex issues as no easy solutions are available. Even with a more realistic public perception of invasive and unsustainable river development, without continued local resistance, other economic influences, direct political action, and a diversified river conservation culture, hydropower will continue to dismantle the rivers of Chile, and the world. Ideally, river management needs to "occur in a consensus context where stakeholders and decision-makers explicitly evaluate acceptable risk as a balance between the perceived value of the ecological goals, the economic costs involved and the scientific uncertainties in functional relationships between ecological responses and flow alteration" (Poff 2010, 2). Finding a way to apply ecologically healthy and socially approved water management, rather than perpetuate free-market demand allocation, requires negotiation and commitment from actors both within and outside of the water sector. While "sin represas" or "without dams" has been a powerful concept in Chile, a global transition towards "ríos libres" or "free rivers" without physical barriers or political economic boundaries is needed.

Additional Research

Here I suggest a few of the many additional research topics not covered in this thesis that would provide important insight. In reference to the institutionalized preference for hydropower in Chile, the need for a more accountable shift towards "non conventional" renewable energies, such as solar and wind, is necessary. The difficulty in finding cohesive social support for this large shift is perhaps as complicated as the political and economic infrastructure changes needed to promote it. Thus, how such a legitimate transition would realistically occur requires further research. Additionally, this analysis did not take into account Chile's consumptive water rights dynamics, which also heavily involve the mining industry, and have created citizen access issues to potable water. Analysis is also needed in reference to Chilean education and specifically the amount of students focused on environmental law. Possible education funding motivations should be considered.

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