

WATER POLICY IN CHILE AND BOLIVIA: A COMPARATIVE CASE STUDY

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ABSTRACT

This thesis addresses three questions: why has universal potable water access not been achieved with the water policy changes made in Bolivia between 1990 and 2000? What can be learned from the water policy changes implemented in Chile between 1980 and 1999? Finally, what changes can be made to both countries' water policies to ensure the sustainable use of water resources? To answer these questions, this thesis reviews water policy changes in Chile as a result of World Bank loans before privatization in the 1980s and compare them to the water policy changes in Bolivia as a result of World Bank loans in the 1990s in the form of water privatization. I argue that water privatization is neither the solution to lack of water access nor the solution to water scarcity. Secondary sources were used to analyze the historical differences of water policy in Santiago, Chile and La Paz, Bolivia to see the effectiveness of privatization as a universal water provider and a solution to water scarcity. The results show that the water policy changes that were implemented in Santiago, Chile before privatization were more effective in supplying affordable water to citizens than the immediate privatization in La Paz, Bolivia. I also analyze the effectiveness of water privatization in both countries, as it pertains to the scarcity of water resources in each region. I argue that privatization of the water sector failed to prepare for water scarcity and I recommend institutional pluralism with sustainable water policy at the forefront as a solution to lack of water access and threat of water scarcity in Bolivia and Chile.

INTRODUCTION

Global water supply is decreasing worldwide, bringing water resources to the forefront of policy concerns. A government's need to provide universal water access to its citizens is a global issue as it is necessary regardless of level of economic development. In recent decades proposed water policies have been implemented in South America to solve the lack of quality water access to urban citizens at affordable prices. La Paz, Bolivia and Santiago, Chile are two cases in which national governments changed water policy in order to improve water allocation, with distinct results. Influenced by neoliberal economic frameworks, both countries introduced water policy changes centered around the privatization of water resources.

David Harvey explains that neoliberalism was the “guiding principle of economic thought and management” in the late 1970s and early 1980s (Harvey 2007: 2). He defines neoliberalism as “a theory of political economic practices that proposes that human well-being can best be advanced by liberating individual entrepreneurial freedoms and skills within an institutional framework characterized by strong private property rights, free markets and free trade” (2). To implement these ideals, neoliberalist thought encourages the creation of markets in order to act as “an ethic in itself, capable of acting as a guide to all human action, and substituting for all previously held ethical beliefs” (3). It is for these reasons that neoliberal leaders such as those in the World Bank and International Monetary Fund (IMF) during this time period encouraged governments to use market exchange to maximize the distribution of social goods by bringing “all human action into the domain of the market” (3).

One of the frameworks neoliberal theorists introduced in this time period was the privatization of national enterprises such as gas, water and electricity. In this paper, privatization is defined as the “ownership of built facilities and the right to profit from the use of those

facilities” (Maestu 2013: 4). Governments in Latin America privatized these utilities in an effort to encourage investment and efficient allocation of resources by introducing them to free market activity. As part of privatization, the Bolivian government changed the water utilities to private companies and sold them to international water companies in order to bring expertise and international investment into its water systems.

The Chilean government however, created a water market in which private water rights were sold to individuals. The distinction between these private water rights and privatization of water utilities is important in this paper because one is the privatization of a company in which the company has the right to the water rights within the city as well as build and profit from facilities that distribute water to citizens. So in the privatization of water utilities, a private company is given rights to water resources in the city in which it operates. Private water rights however allow for a water market in which the rights to *access* water resources can be bought and sold. This market will be further explained later in the paper.

The 1970s economic recession in Latin America led to the implementation of neoliberal economic policies that encouraged the privatization of public resources such as water, gas and electricity (Spronk 2007). The privatization of water resources in Bolivia, was a mixture of policies implemented by President Sánchez de Lozada as a condition for receiving international aid from the World Bank in the 1990s (Laurie and Crespo 2007; de la Fuente 2003). Bolivian water policy changed as the water systems were sold to private foreign companies in an effort to use the foreign investment and revenue gained from the commodification of water to provide universal water access in its cities, La Paz and Cochabamba (Laurie and Crespo 2007).

The late 1990s and early 2000s in Bolivia experienced public sector privatization, social unrest and political turmoil as the government tried to follow international advice and privatize

state enterprises such as water, gas and electricity (Spronk 2006). The debt crisis of the 1980s caused the World Bank to intervene in the Bolivian national economy and encourage privatization with “full cost recovery” in which all costs should be paid for by users and the elimination of water subsidies by the government (de la Fuente 2003:98). The Bolivian government started with the privatization of other industries such as mining which led to increased unemployment and urban migration of citizens in search for jobs (Spronk 2006). The increased populations in urban areas such as La Paz and Cochabamba created a demand for the expansion of water services and President Lozada, with the influence of the World Bank, introduced the privatization of the water company SEMAPA as a way to provide that (Spronk 2006). Privatization in La Paz and Cochabamba in 1997 and 1999 respectively led not to universal water access for their citizens, but instead led to social movements that demanded that the newly privatized water companies leave the country and the municipal water system return to government control (de la Fuente 2003; Laurie and Crespo 2006).

In 2000 a social cooperative, Coordinadora de Defensa del Agua y de la Vida, led protests with up to 50,000 people in which they demanded the removal of the monopoly on water rights given to *Aguas del Tunari*, the international company to which the government sold the water system in 1999 (Spronk 2006). After renegotiations to which the government agreed to lower water prices to their original level within two months, but after failing to meet its promises, the Coordinadora built blockades and 100,000 people protested in the street (17). The Coordinadora successfully expelled *Tunari* on April 9, 2000, returning the water system back to the government (17).

Social movements inspired by the Coordinadora against *Agua del Illimani*, the international company that bought the water system in La Paz and El Alto, started in 2000 as

leaders in El Alto joined the Coordinadora from Cochabamba to make its own branch to protest the monopoly *Illimani* held over the water resources in the city (Laurie and Crespo 2006). The consequent Federation de Juntas Vecinales de El Alto (FEJUVE) would lead the movement against *Illimani* for the next five years until in 2005, the company agreed to leave the city and sell the water company back to the government (Laurie and Crespo 2006: 844).

In addition to the universal potable water provision, water privatization is a proposed solution to water scarcity as the market price would encourage consumers to use less water and therefore protect water resources (Perry, Rock and Seckler 1997). As different as the water policy change implementation was in Santiago and La Paz, the ecological results were similar. The decrease in the size of glaciers that feed the water sources La Paz due to climate change and the “over exploitation of water basins” in Chile are leading to year-long droughts causing the cities to suffer from water shortages (Martinez 2017; Lagorio 2014a: 1). Changes in water policy and the implementation of privatization has not led to the ecological protection of water resources as it was proposed to do as a side-effect of creating universal water access for citizens.

The history of water policy in Chile is comparable to that of Bolivia as the change in economic policy that came with the Pinochet government (1973-1990), privatized major public enterprises including the water sector (Bauer 1998). This type of privatization is different than that of Bolivia because private water rights were granted to individuals, while in Bolivia, universal water rights to all water resources were sold to a single company. In addition, the Chilean water company, EMOS, implemented two major water rehabilitation projects with the financial aid of the World Bank in 1980 and 1986 which managed to expand water infrastructure and develop a price system that subsidized the poor users. Chilean water policy changes occurred over the course of nineteen years (1980-1999) as a way to provide universal potable water access

in Santiago before the privatization of EMOS in 1999, and succeeded. Even with this successful hybridization of the water system in Santiago and the eventual privatization of EMOS, however, Santiago is facing water scarcity due to the regression of glaciers and pollution of mining companies, just like La Paz (FSRN 2016; Archundia, Duwig, Spadini, Uzu, Guerdrón, Morel, Cortéz, Ramos, Chincheros, and Martins 2017).

Research Question and Hypothesis:

Water availability is important as it is necessary for life. It is at the forefront of peoples' minds in Bolivia and Chile as they see their water resources depleting and suffer days without water due to rationing. Water policy is becoming increasingly important as water scarcity threatens to limit water availability and therefore the lives of citizens in Santiago and La Paz. My questions are: 1.) Why has universal potable water access no been achieved as a consequence of the water policy changes in Bolivia between 1990 and 2000? 2.) What can be learned by comparing the Bolivian case with the water policy changes implemented in Chile between 1980 and 1999? And 3.) What changes can be made to both countries' water policies to ensure the sustainable use of water resources in the future?

I hypothesize that the success of the Chilean water market changes lies in the slow implementation of the changes as well as the changes as a social development investment on the part of the water company. The investment made by *Empresa Metropolitana de Obras Sanitaria* (EMOS) in the Santiago water system led to the successful allocation of water and a price system that allowed all users to afford it. Meanwhile the failure of the Bolivian water policy changes lies in the absolute control over water resources given to a foreign private company, which sought profit rather than expansion for the fair distribution of this social good, along with the quick

implementation of privatization without investment or policy change beforehand. I think that institutional pluralism, investment in technology and encouraging societal understanding of the finite nature of water resources will be necessary to ensure the sustainable use of water resources in other countries.

LITERATURE REVIEW

Water Allocation:

Water allocation law has been in effect since Ancient Mesopotamian times as humans have tried to fairly distribute one of the most important resources in our world. It was created to regulate the use of water resources as a public good to ensure that the use of water by one citizen did not impede the use of the same resource by another citizen (Cech 2005). Every ancient empire expanded on the rules and regulations in regards to water allocation, the first of which to name their code being the Roman Empire. The Romans dictated the Common Law of Water, or the Riparian Doctrine. According to these documents, “water in a stream belongs to the public for use by fisherman and for navigation and cannot be controlled by private individuals” (Cech 2005: 213). Another idea implemented in the Roman Law is “reasonable use,” meaning use is limited to that which contributes to production as long as navigation is not interrupted.

Additionally, the Riparian Doctrine required landowners to return any diverted water back to the stream or river after use without any change in quality or quantity. With the Spanish in the 13th century, the government altered the Riparian Doctrine to make water resources the property of the crown. This shift is important to my project because the Spanish influence upon Latin America was so significant through colonization and remains significant today.

The Spanish government created *Las sietes partidas* as their governing doctrine for water allocation that claimed that all “water, land and minerals” belong to the crown (Cech 2005: 214). According to the *partidas*, private ownership required special permission from the crown but rainfall and water flow could be accessed without such permission. When the Spanish Empire stretched to the New World, it used the *sietes partidas* to give colonizers autonomy to extend

water allocation so as to make the land more productive and therefore more profitable for the crown. With Madrid so far away from the colonies, the crown allowed each town to regulate their own water allocation and often encouraged the continuation of water allocation systems put in place by native populations. Water allocation was seen as a necessity for growth and sustainability and was divided up as such to fairly supply all of the inhabitants of a city or town (Cech 2005: 215). Today, water is not as ubiquitous as it once was. Freshwater resources are depleting and becoming polluted and human demand for the resource has increased along with population, leaving a difficult set of decisions to be made in the way of adequate dispersion and equal access for all.

Latin America is known for its lack of “development” compared to the “more developed” nations in North America. There are numerous strands of thought as to why this is the case (Acemoglu and Robinson 2012). One of the most prevalent issues today is water allocation and the potential for limiting growth and development within Latin America (Easterly and Serven 2003). Geographically speaking, Latin American countries have a wide array of environments from forest to arid lands to coastal regions. This makes water allocation difficult because some areas have access to plenty of water while other areas have none. On top of this, climate change is altering the game in regard to the amount of water available in different places. Because of this, water allocation is becoming increasingly important and countries are seeing the need to reorganize their allocation systems in order to protect their industries, citizens and land.

One suggested solution to global water scarcity is water privatization (Perry , Rock and Seckler 1997). Treating water as an economic good has the potential to encourage investment in the water sector, and limit usage as people recognize that increased usage leads to higher prices and lower supply (Perry et al. 1997). Because of people’s inescapable need for water, however,

water privatization faces criticism particularly when its implementation has proven to be difficult. Efforts to privatize water in Latin American have led to social movements demanding water as a human right rather than an economic good.

In most countries, including Bolivia and Chile, water is considered a public good, meaning that all citizens have the right to use it. Problems arise however when the use by one citizen affects the use by another, meaning contamination, overuse, or rerouting, known as “third party effects” or “externalities” in this context (Donoso 2006). Furthermore, governments can often not afford to supply good quality water to all of the country’s citizens because of inefficient infrastructure, lack of engineering expertise, and corruption.

In the mid 1900s, Latin America adopted protectionist policies such as import substitution to try to keep wealth and economic growth within the country. As such, the governments were responsible for the supply and management of multiple industries that were not able to attract foreign investment. While Import Substitution Industries (ISI) sparked significant economic growth for Latin American countries, high interest rates and lack of foreign direct investment caused economic stagnation, and their international debt grew, bringing the World Bank to intervene in the economies of these countries. As a result of the increased international debt, the international lenders sent economists to the indebted countries such as Chile and Bolivia. Economists encouraged privatization to spur foreign investment and spark economic development to lead to the end of international debt. Since these economists recommended privatization as the solution to economic stagnation, the World Bank set privatization of public services as a requirement to receive financial aid (De la Fuente 2003).

In the 1980s international aid corporations encouraged developing countries to adopt liberal economic reform as a stipulation for continued financial aid. As such, many Latin

American countries privatized their public industries, such as electricity, mining and water. The process of privatization cost many citizens their jobs, encouraged urbanization and increased the prices of these goods so much that citizens and social movement organizations resisted the privatization brought by the “developed world”. While each country underwent a unique reform, results were often similar as citizens started movements to fight the privatization of their industries.

Privatization fits into the school of thought known as Integrated Water Resource Management (IWRM) through which academics and water experts have tried and are trying to enhance global water availability. IWRM is defined as “the process of promoting the coordinated development and management of water, land and related resources to maximize the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems” (Setegn and Maria Donoso 2015: 2). Privatization is a proposed form of IWRM as an option for water allocation expansion. A review of the scholarship on water privatization is useful for our purposes here.

Privatization:

Josefina Maestu, Director of the United Nations Office to Support the International Decade for Action “Water for Life”, defines water privatization as “ownership of built facilities and the right to profit from the use of those facilities” within the water sector (2013: 4). Privatization in the cases of Santiago and La Paz includes the unlimited water rights granted to the water companies in each city. The hope of water privatization is that the pursuit of profit will lead to better service, infrastructure and quality while also encouraging water users to limit their use (Maestu 2013). Privatization also would ideally bring foreign direct investment, allowing the

financing of water services to come from outside the country and give water companies the incentive to expand water supply while improving water service.

In Maestu's book, she describes the water trading experience in the western United States to demonstrate the successful use of a water market. Here, the water price system allows for different users to pay different amounts in order for different sectors to use the appropriate amount of water to remain productive. The agriculture sector, for example, is charged less than urban users in the western United States because its products benefit all of the citizens (Maestu 2013). An important aspect to this water market however is the high amount of investment required to keep the water market running. Latin American nations often lack the technology and the capital to finance the same systems.

According to CJ Perry and his colleagues, Coordinator of Research at the International Irrigation Management Institute, a non-profit scientific research organization focused on the sustainable use of water resources in developing countries, the public sector has failed in its responsibilities to provide water to its citizens in Latin America. In his article "Water as an Economic Good: A solution or a problem?" he explains that the public sector allows corruption to plague the water supply systems (Perry et al. 1997). Since powerful water users can bribe the officials in charge of water management, incentives are separate from performance (Perry et al. 1997). These problems lead to the same inequalities that have always plagued developing countries; the few rich benefit from the corrupt system while the poor masses suffer.

For Perry et al., privatization is the solution. It can free up government resources, encourage efficiency and allow the rich and poor to invest equally into water systems. Pricing systems would be set up to ensure that the water the citizens depend on for life is charged at a lower rate than the excess usage of water by the people who can afford it. In line with this

thinking, Perry describes water markets as the best way to introduce water privatization. Water markets would allow for water to be used according to value to individual users, and subsidies would allow for poor users to have water access.

John Cohen and Stephen Peterson propose institutional pluralism as the alternative to privatization in public sector products. Institutional pluralism is centered around the idea of breaking up monopolies. To do this, institutional pluralism divides roles spatially (or geographically) instead of by institution (Cohen and Peterson 1999). According to David Osborne and Ted Gaebler, as cited in Cohen and Peterson's book, the government should act as an entrepreneur that can "structure the marketplace to fulfill a public purpose" (Cohen and Peterson 1999: 87). This idea is that the government should also be a participant within the market. The idea behind their proposal is to use private market resources to facilitate the sale of public resources while the government monitors the market in order to assure water access for all citizens. This way, multiple companies (private and public) can compete to supply consumer demand while the government manages the market to ensure the sustainable use of water resources as well as affordable water access. These companies would compete within regions in which the local government would dictate the limitations of the market to best represent the population they would serve.

Ecological Issues:

The ecological effects of water use are becoming increasingly important as fresh water resources become scarce. Chile and Bolivia both rely heavily on glaciers for their freshwater supply. Climate change has resulted in significant glacier recession making citizens aware of the need for sustainable water resource management (Martinez 2017). Perry claims that treating

water as an economic good would endanger the long-term sustainability of water resources as companies would try to increase sales and therefore water usage (Perry et al. 1997). If privatization leads to financial incentives for the companies to sell more water, then the water resources of a country are not being used in the most sustainable way. With the recession of glaciers, Bolivia and Chile cannot afford to waste water resources simply for the financial gain of a private company, water is not a resource that a civilization can survive without.

Professor in Water Management at the University of Twente in the Netherlands, A. Y. Hoekstra founded the concept of a “water footprint”. He defines a *blue water footprint* as the “consumptive use of ground and surface water flows” (Hoekstra and Mekonnen, 2012). In his study, *Global Monthly Water Scarcity: Blue Water Footprints versus Blue Water Availability*, he and his colleagues explain the blue water footprint of the inhabitants of 401 different river basins throughout the world by measuring the level of water scarcity in each region. The degree of water scarcity is determined by the ratio of the blue water footprint in a basin to the blue water available. The *blue water availability* is the “volume of water that can be consumed without expected adverse ecological impacts” (Hoekstra, Mekonnen, Chapman, Matthews and Ritcher 2012). In this study he recognizes the seasonal change in water availability and studies blue water scarcity by month rather than year. This allows us to see that average water availability per year does not accurately depict the level of water scarcity in different seasons. This is important because as the seasons change, water availability changes and therefore the severity of water scarcity also changes. Hoekstra et al. reveal that in a given year 201 basins, half of the basins studied, with 2.67 billion inhabitants experience severe water scarcity at least one month of the year (Hoekstra et al. 2012: 3).

Hoekstra et al. explain that many societies overuse their water resources such that the ecological health of the river basins is changed. His “presumptive environmental flow requirement” specifies that water consumption of a river basin should be less than 20% of the water available in order to protect the ecological health of the river basin. This is an important idea for water policy to acknowledge in order to produce sustainable water policies for cities that will allow future use of these resources.

Although this report lacks specific data on Bolivia, the data show that areas in northern Chile suffer 12 months with water scarcity over 100% and areas in Argentina have up to three months a year of over 100% water scarcity. Water scarcity over 100% indicates that the water usage of the river basins in these areas is over 20% of the blue water availability and therefore is not sustainable. Hoekstra’s definitions and frameworks are important for the context of water usage and scarcity in these two countries. As increased urbanization endangers the quality of water, glacial regression threatens water availability. In the face of the scarcity of such a vital resource, experts on water management have proposed a myriad of solutions that include more efficient and productive water systems and keeping the presumptive environmental flow requirement in mind while making water policy.

Stephen Brichieri-Colombi proposes a Water in the National Economy (WINE) strategy as an alternative to privatization. According to Brichieri-Colombi, water planners should be decision makers “over the Earth” and should be trusted to solve water scarcity with solutions other than increased infrastructure (Brichieri-Colombi, 2009). He proposes that we look at water in a socio-economic context and consider solutions that alter the demand and supply of water rather than the appropriate policy for the distribution of it. He believes that thinking of water simply as a commodity is not enough. Instead, we must now consider variables that were

previously considered “externalities” such as social contexts and political regimes in order to fully consider the water resources and availability around the world.

Brichieri-Colombi’s theory is one not used in water policy in either country but it is supported by my research in that social contexts and political regimes defined the water availability in these countries. Furthermore, his theory of decreasing water usage as a social change rather than a policy or economic one is important for my study because environmental protection is not usually a priority in the most efficient forms of production in industries outside the water sector. A societal understanding for the need to protect water resources is important for the future so that citizens are more conscious and therefore support more sustainable water policy.

All of these frameworks come into play when discussing the water policies in Chile and Bolivia, as both countries tried to create water systems that would finance themselves and still allow water access to all of their citizens through privatization. The ecological contexts of these countries are similar as they are both experiencing glacier regression and as a consequence, water scarcity. Water resources on Earth are becoming increasingly scarce and therefore increasingly valuable. In this paper, I research the water policies of Chile and Bolivia in an effort to build a holistic historical account of how water policy has affected water access in each country and furthermore, how those policies have prepared for the threat of water scarcity. Previous research has analyzed water availability for citizens in La Paz and Santiago, however this research analyzes these water policies as they pertain to water availability and proposes changes to water policy to best handle water scarcity in the future.

METHODS

For this paper, I have compiled and analyzed secondary sources to depict the water privatization implementations in Bolivia and Chile and demonstrate how these frameworks did not successfully supply their citizens with affordable water nor did they protect the sustainability of their water resources. I use historical analysis of water policy politics to show how social political histories affected the water policies and how those in turn affected water availability as we see it today.

I used the university library databases to collect articles on water policy in Bolivia and what led to the Bolivian Water Wars. As I found information on the water policy and the transition to privatization in La Paz and Cochabamba, Bolivia, I read further into water policy frameworks literature from all over the world. I found the water market in Chile to be the only one in the world and one of three regions (including Australia and the western United States) to separate water rights from property rights. Since Bolivia and Chile are neighbors and water is a geographical resource, I wanted to compare the relative success of the water policy in Chile to that of Bolivia.

I consulted studies with specific price, allocation and environmental data to compare the results of water policy in both countries and to propose water policy changes to provide water access to the citizens of each country. I compare proposed Integrated Water Resource Management frameworks and their implementation in each country with their respective outcomes to propose a water policy framework in which a societal and political shift will allow for water resources to be treated with financial and social value as it is a resource that is not solely an economic nor social good.

EMPIRICAL CHAPTER A: CHILE

Water Policy History

Carl J. Bauer, an expert in the field of water policy and water rights gives a brief history as it pertains to water policy in Chile in his book *Against the Current: Privatization, Water Markets, and the State in Chile* (1998). The history of water policy in Chile can be analyzed from the economic downturn in the 1920s and subsequent protectionist policies. The government invested heavily in infrastructure and industry as well as encouraged import substitutions which led to the virtual isolation of Chile as it closed itself off from international trade (Bauer 1998: 3). The 1960s in Chile were plagued with slow growth, chronic inflation and high poverty rates. During this time, the reformist party, inspired by the Cuban Revolution like much of Latin America in this era, in the form of the Christian Democrats, gained political power in 1964 with Eduardo Frei (Bauer 1998: 4). Frei increased the state's economic intervention, including expanding state authority over water use.

In 1967 the Christian Democrat government passed the 1967 Agrarian Reform aimed to redistribute wealth by redistributing large pieces of land amongst peasant farmers and farm laborers (4). In the process of redistributing land, the government often expropriated land without compensating the original owners. Frei's socialist agenda was carried on by his successor, Salvador Allende, who expanded the state role in the economy and accelerated the actions of the Agrarian Reform (4). He nationalized private industries in an effort to immediately control the financial status of the nation. According to Bauer neither Frei's nor Allende's plans achieved the social equity they set out to gain, and Allende was overthrown in a military coup by Augusto Pinochet and his military Junta (4).

The authoritarian government focused entirely on free-market principles and economic reforms, in reaction to the socialist policies of previous leaders. With the help of the Chicago Boys, men who studied at the University of Chicago (the leader of academic neoliberal thought of the time), the new government reduced the state's role in planning, regulation, ownership and provision of social services (5). The new model opened the country to the world economy by being export oriented and emphasizing comparative advantage.

Debates between what Bauer calls the hardliners (authoritarian nationalists) and the softliners (Catholic corporatists or gremialistas, and neoliberal economists) led to the creation of the Constitution of 1980. Within this constitution, chief architect and gremialista Jaime Guzmán, set up a “new institutional order” to set the framework for what they called a “protected democracy” (13).

Part of this framework was the Water Code of 1981 in which the Chilean government set a basis for how water rights were to be distributed thereafter. Professor of agrarian economics at the Pontificia Universidad Católica de Chile, Guillermo Donoso, writes extensively of this code and according to him, it dictated that water is “national good for public use” (Donoso 2006: 158). It protected water use rights, and granted permanent, transferable water-use rights to individuals with the goal to create efficient allocation of water through market transactions (Donoso 2006). In an effort to make the water allocation system function like a free market, the Code created water use rights (WUR) and allowed them to be traded freely. The right of use over water has the same constitutional rights as those for property, allowing individuals to “use, enjoy and legally dispose of water with complete freedom” (159). The government made these efforts in order to set up a water rights market in which supply and demand would allow for water to be transferred from lower to higher value activities. This means that whoever values the use of the WUR the

most, would pay the highest price and therefore WUR owners would use them for the most efficient purposes. The Water Code also decreased the intervention of the government in the institution of water, and transferred that responsibility to water user associations (Maestu 2013).

The definition and application of WUR is specific and complicated. Guillermo Donoso, a professor in the College of Agriculture and Forestry Engineering at the Universidad Católica de Chile, explains the different types of WUR, and how they are allocated in his article “Water markets: case study of Chile’s 1981 Water Code” (Donoso 2006). The application to gain water allocation rights includes three main components. The applicant must identify the source from which the water is to be gathered, with the specification of surface water versus ground water. Secondly, he/she must also indicate the quantity of water that will be extracted (in liters/second). Third, applicants are to specify which points along the source the water will be extracted and lastly, note whether the right is “consumptive or non-consumptive, permanent or contingent, continuous, discontinuous or alternating” (Donoso 2006: 160). Applicants need not be landowners, they can apply for water rights independently from their property ownership.

Consumptive water use rights are surface and groundwater WUR that “does not require that the water be returned after being used, and the owner of this right may totally consume the water in any activity” (Donoso 2006: 160). *Non-consumptive water rights* are rights in which the right owner may divert water for use but must return it unaltered to its original channel (Donoso 2006, 160). Non-consumptive rights may not interfere with consumptive water rights by altering quality nor quantity (160). *Permanent water rights* include the right to use water in certain amounts, measured as volume by unit of time. *Contingent water rights* are those that allow rights owners access to a water source only after permanent water rights owners have satisfied their needs (160). In a time of scarcity however, both permanent water rights owners and contingent

water rights owners split water flows evenly (160). *Continuous water rights* allow right owner to access water any time of day or night any day of the year while *discontinuous water rights* only give owners access to water for specified periods of time (Donoso 2006). Finally, *alternating water rights* allow for two or more owners to use the water resources “successively” (Donoso 2006: 160).

At first, applying for WUR was free and the application only needed only be published in the *Diario Oficial*, the daily Santiago newspaper and again in the local newspaper wherever the applicant applied for his/her WUR (Donoso 2006). Auctions were held by the government to resolve any water right competition, the WUR going to the highest bidder and therefore ideally routing water usage to the highest value activity (Donoso 2013). Free WUR and no minimum requirements for usage led to water hoarding. Eventually the state discussed non-use tariffs to prevent false water scarcity, but they were never enforced because agricultural WUR owners preferred to keep their rights in the chance of water scarcity (Donoso 2013, Bauer 1998). If there is a societal interest in the allocation of water that cannot offer the highest bid, the President of the Republic can overturn the bidding process and allocate the available water accordingly (Donoso 2006: 162). New water rights can be granted but they must go through the same application process and must prove that the new rights do not infringe on any already allocated WUR (161).

As far as water management however, WUR owners are mainly responsible for their water resources. As such, WUR owners created Water User Associations (WUA) in which WUR owners can manage the trading of water rights and oversee their usage. There are three types of Water User Associations: water communities, vigilance committees, and canal user associations (Donoso 2013). Water communities are any formal group of users that share a common source of

water. Vigilance committees include all users and canal associations on any river, river section or stream. They administer water and allocate water to different canals. Finally, canal user associations are formal associations with legal status that can enter into contracts (Donoso 2013). Many of these WUA have professional management, but have not updated their capacity to meet new challenges in order to better serve their members (Donoso 2013).

The governmental institution responsible for monitoring and enforcing Water Use Rights is the Directorate General of Water (DGA) (Donoso 2013). According to Donoso, the main concern with the transfer of water rights is if the transfer results in a change of water intake location because this could change the externalities caused by the new WUR and harm another users WUR. The DGA must authorize water transfers in order to maintain decorum amongst WUR owners. In addition to this the DGA analyzes the potential third party effects caused by the transfer before authorization. In addition, it makes sure that new water right petitions are broadcasted three times through national and local newspapers. They are also responsible for collecting compensation for any environmental damage caused by transfer. The DGA also provides adequate and timely information for potential WUR buyers and sellers. Donoso claims that the Chilean water market would benefit from a more transparent mechanism to reveal prices to all participants within the water market in order to assure that all are receiving the same prices regardless of level of experience (Donoso 2013: 126).

WUR are important to my study because they represent the institutionalization of water rights separate from land for the individual and recognize externalities as well as seasonal use, showing that the creators of water policy in Chile recognized the impact of water policy on the use of water resources. Specific to water availability, the WUR are important because they allow the state-owned water company to function as an individual WUR owner, not simply as a public

provider. This contributes to the idea of treating water as an economic good, allowing for efficiency and investment, just as WUR encourage the same for individuals within the water market.

Santiago Water Availability

In order to see how the water rights changes affected the water access for citizens in Chile I look to Santiago and the results of water policy change in the wake of the Water Code of 1981. The projects implemented in Santiago by the public municipal water supplier, EMOS, before the privatization of the company in 1999 led to the increase in water access for citizens of Santiago and caused the company to become profitable, allowing it to be sold for profit in 1999 to Aguas de Barcelona-Suez (Pfleigler 2008). EMOS was granted WUR by the government in order to provide the city of Santiago with water access, once the company had these rights it was able to operate as a private company (Baer 2014).

Santiago, the capital and largest metropolis of Chile, underwent major rehabilitation projects for its water allocation system in order to match the high influx of people from the 1950s to the 1970s. In the 1950s Santiago already suffered from contaminated water sources and deteriorating water infrastructure, so when people migrated towards the cities, the water systems were insufficient to supply this growing urban population. Géraldine Pflieger in her article “Achieving universal access to drinking water and sanitation networks in Santiago de Chile: An historical analysis” gives us an overall account of the history of water policy in Santiago and its effects on water access for the citizens. Jorge Alessandri, the Chilean president from 1959 to 1963, implemented a project to demolish the settlements of newly migrated people. He relocated them to “hard constructions,” permanent settlements built by the government (Pflieger 2008: 24). Eduardo Frei president from 1965 to 1970 built on Alessandri’s ideas in his *operación sitio*

project in which he moved 52,000 families to new hard constructions. The problem with these projects is that the new constructions were often in areas of the city that did not have the infrastructure to supply water and sanitation services. The lack of services caused an increase in the number of *campamentos* or illegal settlements on the periphery of the city during this same time period (Pflieger 2008: 24). The inhabitants of the *campamentos* came together to form social *pobladores* movements in which they demanded housing and basic utilities in the 1950s and 60s.

Because of the high urbanization rates during the 1960s, access to water in urban areas in Chile was 83% in 1970 in the Greater Santiago Area compared to the 93% that had access in 1952 (Pflieger 2008: 22). In addition to the decrease in water access for the citizens of Santiago, the allocation within the city was unequal. The 1970 census showed that water access in affluent neighborhoods was between 89 and 99 percent, while the outskirts of the city had between 78 and 85 percent. Even more unequal in the outskirts of the Greater Santiago Area, water access was between 66 and 75 percent (Pflieger 2008).

In 1973, Pinochet and his military Junta came to power and implemented a series of neoliberal reforms that would encourage private ownership and investment. He forcibly ended the construction of *campamentos* along with the public housing construction programs. The result of these actions was that the 200,000 people in the *campamentos* had no government program to help them move into safer settlements nor gain access to water and sanitation services. In 1979 Pinochet implemented the National Urban Development Policy in which the state began three demand-based approaches that encouraged individual ownership of homes.

First, from 1985 to 1990 the subsidized housing programs produced forty-five percent of the new housing. Fifteen percent of the new housing developments were part of the *subsidios*

habitacionales program that allowed people to buy houses in the private market with subsidies up to 25% of the property value (Pflieger 2008: 27). Between 1980 and 1989 *subsídios habitacionales* built an average of 20,000 subsidized houses per year, but the people who benefitted from this increase in housing were part of the middle class of Santiago, not the population that suffered from lack of water access (27).

The second program supplied utilities to their inhabitants as well as providing a home. *Viviendas básicas* relocated people from the *campamentos* that allowed them to purchase houses with subsidies up to 75% of the value of the property. Finally, the *radicación*, or the rooting, program rehabilitated the villas with financing from the Inter-American Development Bank. This program gave families the deed of ownership, a room, known as *casetas sanitarias*, along with utilities such as water, wastewater disposal and electricity (28). With these programs in place, the state created 48,800 new connections to water, sewerage and electricity across the Greater Santiago Area between 1979 and 1992 (28).

Responsibility for the water system in Santiago before the 1970s was split across three different governing bodies, making regulation and management unclear. In 1976 in a move of decentralization, eleven independent and regional public companies took responsibility for regulating water systems across the country while the *Empresa de Agua Potable de Santiago* (EAPS) became the regulatory and managing force in Santiago. Later called *Empresa Metropolitana de Obras Sanitarias* (EMOS), but still the public water utility, it became responsible for the overhaul of the water system in Chile in the 1980s.

In 1980 EMOS “progressively reformed” its rate structure to better cover operational and modernization costs and short-term investments (Pflieger 2008: 31). With this system it set up three rate groups in an effort to set cross-subsidies based on consumption. The first rate group

was for consumers that used less than 15 m³ per month, in which case their usage would be subsidized completely by the company. The next rate group would be for users that used between 16m³ to 31m³ per month, they received a reduced rate for the first 15m³ and paid the regular price for excess usage. The final rate group was for consumers that used 31m³ to 45m³ per month. These users paid an increased rate for all of their water, and these increased prices were used to subsidize the first two rate groups (Pflieger 2008: 31). The idea was for more affluent households to help pay for a basic need for households that could not afford it as well as to encourage users to use less water and therefore protect this vital and limited resource. With this system in place, prices of water started at USD 0.19/m³ in 1981, decreased to 0.08/m³ in 1985 and settled at 0.11/m³ in 1998 (Pflieger, 2008: 31).

Part of Pinochet's plan included allowing free-market principles to dictate the growth of Santiago. In a 1979 decree he drew out two zones, an *urban zone* and an *urban expansion zone* (Pflieger 2008). According to this plan, the state would permit urbanization in both areas, but was only responsible for supplying utilities, public services and improving facilities within the *urban zone*. By 1985, urbanization sprawled to only 40,000 ha of the 100,000 drawn out by the decree in both areas. The people that urbanized these areas were the wealthier citizens of Santiago, built by private contractors. These houses, since they were part of the *urban expansion zone*, were not supplied by EMOS but instead were supplied by private water companies. These private water companies charged higher prices than EMOS and provided approximately 42,000 people with water as of 1983, with volumes as high as 0.69 m³/h/d (m³/household/day) (Pflieger 2008: 38). That was at least 42,000 people whose higher prices were not contributing to the price system EMOS created in order to subsidize the poor who could not afford to pay for water. This price system created the hybrid model EMOS used as it operated as a private company with

revenue and investment but a public company as it used wealthier customers to subsidize poorer customers to allow universal water access.

Essentially, the wealthier citizens avoided the price network EMOS set up in order to provide water to all citizens in Santiago, and therefore the higher rates intended to help poorer residents gain access to water were moot. This is important to mention because the pro-poor framework set up by EMOS was made less effective because the rich neighborhoods paid alternate water providers for their water. EMOS still managed to generate revenue from its price system, however rich neighborhoods redirected their wealth that would be able to help subsidize poor users had it been spent inside EMOS.

The new rate system caused the “overall revenue” from water and sanitation bills for EMOS to be 50% in 1979, 70% in 1982 and 90.5% in 1984, while the rest came from company investments and the World Bank loan (Pflieger 2008: 31). These numbers allowed for EMOS to attract major private investments when it launched an investment program aimed to extend and improve access to drinking water in 1981. Together with the USD 26 million the World Bank contributed to the program, EMOS was able to finish an aqueduct that would supply higher altitude areas, an 83 km supply network and 14 new reservoirs (Pflieger 2008: 32).

All of this is important to show that the government-led water policy change through EMOS was effective in gaining revenue for years after it implemented the change, but forces out of the company’s control limited their success. According to Pflieger, the revenue EMOS intended to collect from the rich households went to alternate water providers instead of helping finance water supply to poor residents. The Water Code of 1981 allowed for EMOS to function as a private entity, owning water rights and selling water at a competitive price with the intention of attracting investment. At the same time the Water Code also allowed alternate water providers

to compete for the same customers within the Santiago Metropolitan Area. In Santiago the disadvantaged people still did not have a consistent water supply as the richer citizens continued to enjoy water access provided simply by their wealth.

Results of Water Policy in Chile

In 1986 the World Bank and EMOS teamed up again for a second loan to improve water sources in Santiago to decrease the occurrence of typhoid fever caused by water borne bacteria. This project aimed to “upgrade potable water quality and increase available water quantity by improving operation and maintenance and reducing water losses in the water distribution system” and “to strengthen the management and cost control system” of EMOS (World Bank 1996: ii). The results of the second World Bank- EMOS project are shown in Table 1.

Table 1: Water Supply Project Scope for Santiago

	Estimated in SAR (km)	Actual (km)
Primary Distribution Pipes (300-1200mm)	55	94.1
Secondary Distribution Pipes (75-300mm)	46	32.9
Reservoirs: new	9 (65,000m ³)	18 (242,500m ³)
Reservoirs: Rehabilitation	1 (20,000m ³)	3(44,000m ³)
Wells	5	5
Pressure Control and Macrometering	Not quantified	Part of Civil Works

Source: World Bank 1996

The Table quantifies the total length of distribution pipes that the rehabilitation project built in comparison to the amount it was projected to build. The Staff Appraisal Report (SAR) created at the beginning of the project predicted the creation of 55km of Primary Distribution

Pipes (100-1200mm) when in reality, at the completion of the project in 1995, it had created 94.1km of Primary Distribution Pipes. The project also overshot its expectations in new reservoirs by creating 18 reservoirs with a capacity of 242,500m³ instead of 9 with a capacity of 65,000m³. The trend continues with the number of rehabilitated reservoirs by rehabilitating 3 rather than 1 with the capacity of 44,000m³.

The success of this project and the data that shows how it exceeded the expectations of the World Bank provides evidence that EMOS was an efficient company with the appropriate technicians and professionals to use the aid given by the World Bank to directly benefit its users. As we will see later, these results contrast those of the Bolivian water rehabilitation project.

An important aspect of this project is that EMOS supplied close to 70% of the financing, meaning that the World Bank actually invested less money than it originally planned. According to the World Bank Implementation Completion Report, “EMOS was able to finance the additional costs from internally-generated funds as a result of the improvement in its financial position” (World Bank 1996: iii). This made the water system economically sustainable because EMOS could afford to operate independently.

In 1989, EMOS became a shareholding company of which the government company, Corporación de Fomento de la Producción (CORFO) bought 64.6% of the shares, the Chilean government itself bought 35% of the shares and private shareholders bought 0.4% of the shares (World Bank 1996: 3). CORFO, founded in 1939, is a public investment company whose mission is “to improve the competitiveness and the productive diversification of the country by encouraging investment, innovation, and entrepreneurship, strengthening in addition the human capital and technological capabilities to achieve a sustainable and territorially balanced development” (CORFO 2015). Additionally, because of the Water Code of 1981, the

government was required to buy into the company just as any other investor would. Combined with investments from private investors who would benefit from the increased construction that would follow the expansion of the water network, EMOS was able to fund the majority of the rehabilitation project (Pflieger 2008: 31).

The EMOS expansion also increased the prices of water enough so as to decrease the average consumption of water throughout the city from 35.8m³ per connection per month in 1987 to 31.6 m³ in 1994 (World Bank 1996: iii). Price hikes between 1989 and 1990 equaled 50% and by the end of 1998 had almost doubled, allowing the company to profit and average of \$40 million USD between 1992 and 1996 (Pflieger 2008: 43). Even with these price hikes however, the level of water consumption did not decrease. This is important to mention because one of the arguments for water privatization is the claim that unsubsidized prices would lead to the decreased usage of water resources. This example shows that even with subsidized prices, the increased prices did not decrease the level of water consumption. The success of the price system led the World Bank to grant EMOS another loan in 1987 of \$60 million USD to help expand water infrastructure and sanitation even further (Pliieger 2008, World Bank 1996).

In 1988-1990, the government of Chile created an autonomous body with judicial and economic power in the water sector, implemented a tariff to ensure the long-term financing of the service and created a system to help low-income consumers pay their water bills. The Superintendencia de Servicios Sanitarios (SSS) was in charge of “granting concessions for water and sewerage services, setting standards for the sector and controlling compliance with them and calculating tariffs and controlling their implementation” (World Bank 1996: 2). These reforms would help make EMOS sustainable for the future and keep water access to citizens cheap

enough to afford while still making enough revenue to invest in water infrastructure throughout the city.

The institutional and rate changes that EMOS implemented in the 1980s and 1990s were incredibly important in the construction of water system infrastructure and water allocation within the Santiago Metropolitan Region. EMOS set up a social economic market by implementing the new rate system it created in the 1980s that started a pattern of pro-poor water systems in which the poor users are subsidized by the richer ones. The water market The money given by investors allowed EMOS to function as a private entity still concerned with public service and state. Through these changes EMOS was able to reach a level of efficiency that would rival the private water suppliers that targeted affluent neighborhoods. Furthermore, the framework that EMOS implemented during this time prepared it for the partial privatization of the company in 1999, allowing the international company that bought EMOS function within a water system that was already set up to serve the entire city, not just the rich citizens (Pflieger 2008: 41).

The privatization of EMOS in 1999 was a result of the democratically elected Concertación wanting to attract investment in order to finance an improvement and expansion of wastewater treatment facilities (Baer 2014). The government sold 51% of EMOS shares to *Sociedad Inversiones Aguas Metropolitana*, a consortium including French company Suez Lyonnaise del Eaux and Spanish company Aguas de Barcelona (157). In 2001 the company name was changed from EMOS to Aguas Andinas, a name it still carries today (157). Up until 1999, the water companies in Chile, including EMOS, were “still private businesses meaning the assets were still in the hands of the state although they were managed like private companies” (156).

Chilean Ecological Story

Donoso and Bauer both criticize Chile's Water Code and reform for allowing the overuse of water resources (Bauer 1998, Donoso 2013). The Water Code allows for individuals to sell seasonal water rights between industries that only require heavy water use for part of the year. According to them, allowing heavy water use year-round split between to industries is causing water resources to be used to the point of scarcity (Bauer 1998). While this issue mainly affects rural areas, water rights are especially sensitive as water use upstream affects those downstream, or what experts call externalities. With the water market in Chile, as water resources become scarce, the price of water will only increase, encouraging WUR owners to hold onto their rights in order to use them in times of scarcity.

Even with all of the water policy changes in Chile, Santiago still suffers from water scarcity today. Pollution, droughts, heavy rains and landslides threaten potable water access for the citizens of Santiago. Social protests and heavy criticism of Aguas Andinas' (the water utility that serves Santiago) lack of investment in preventative infrastructure are evidence that ecological changes threaten water availability (Gracia 2017). Sources report that 84% of the fresh water resources in the country flow into the Pacific Ocean without being used. With evidence such as this, thousands of citizens in Santiago have taken to the streets to demand the re-nationalization of the water supply systems and many of Chile's senators have called for water nationalization (Gallagher 2016).

Climate change is causing water scarcity and affecting water availability in the Maipo River basin, the basin responsible for 70% of the water supply to Santiago (FSRN 2016). Glacier retreat between 1995 and 1997 for the glaciers surrounding Santiago has been reported to be between 0.2 km² and 2.8 km², meaning that water availability in Santiago is decreasing (Rivera,

Casassa, Acuña and Lange 2000: 50-51). Pollution and flooding of the river basin create dirty water that the citizens cannot drink, leaving millions without water for days as Aguas Andina tries to deliver water to its customers. Furthermore, water delivery in emergency situations is often unsanitary and requires citizens to re-chlorinate their water individually (Reuters 2016).

In the past 10 years Chile has bounced between drought and flooding, both of which leave millions of people in Santiago without water. Chile was plagued by drought for 8 years from 2007 to 2015, leaving the reservoirs at 66% capacity (Lagorio 2014c). This shift in the environment forced the government to reconsider water policy and search for emergency measures to take in order to provide access to potable water for its citizens. Paired with interspersed flash floods, leaving millions of people without water, Chile is in a situation today that will require an overhaul of its water policies.

Finally, a project called Alto Maipo is threatening the water availability in Santiago. The project, driven by a multinational company based out of the United States, plans to reroute the river in order to flow through an energy generating turbine to supply a nearby mine (FSRN 2016). Citizens have protested this project for seven years, explaining that the construction of the turbine would cause serious pollution to Santiago's major water source (FSRN 2016).

Competition over resources between citizens and the mining industry is not uncommon in the history of resource availability in Chile. The industry is so large that mining often dominates the demand for water and energy resources. Mines in Chile require large amounts of freshwater to successfully run, but they cause pollution in the drinking water for citizens and often take away water resources that would otherwise be used for citizens. Because of this, the government and mining companies are looking to invest in desalinization as a way to provide their own freshwater instead of taking from the resources needed to provide for the people (Craze 2015).

The importance of discussing the water scarcity problems in Chile is that even though its water market and Water Code are considered a success in the minds of neoliberal economists, the “short-term, profit-driven resource management” did not prepare the country for the water scarcity that they are facing now (FSRN 2016). We are reaching a point in time where capitalization and profit at the cost of natural resources is no longer an option. Water availability is decreasing and policy is going to have to change to address this new problem in nations where water supply is insufficient.

All of this information shows that even with the systematic changes made before privatization, and the privatization of the water system in Santiago, water resources are still becoming scarce. While EMOS was able to set up a pro-poor framework and price system to better supply water access to all of the citizens in Santiago, it was not able to set up a framework that would minimize water use. Water resources in Santiago are becoming scarce and as of 1999, the privatized water company, Aguas Andinas, has not been able to build a framework in which the water resources of Santiago are protected, nor one in which they are used most efficiently. It is important to note however, that water scarcity was not a major focus for the changes EMOS made in the 1980s and 1990s. Privatization has not created a water market in which the sustainable use of water resources is being implemented. Perhaps returning to a hybrid private/public water entity such as EMOS would provide more success in this area since profit was not the driving force for EMOS.

EMPIRICAL CHAPTER B: BOLIVIA

Water Policy History

The economic downturn in the 1980s brought international attention to Bolivia as economists sought to implement their new theoretical frameworks as solutions to the economic problems of developing nations. The International Monetary Fund suggested the country implement Jeffery Sachs' "orthodox shock." With this new ideology, the Bolivian government, with the help of German economists, developed the New Economic Policy (NEP) which called for the shrinking of the government as an industry owner and called for the privatization of most services, such as water (Spronk 2007: 10). Also contributing to the dialogue of water resource reform was the International Conference on Water and the Environment in Dublin, 1992, Article 5.2 of which states that "Water should be considered an economic good having a value consistent with its most valuable potential use" (ICWE 1992). This conference and the frameworks developed there dictated economic and social water policy in the years afterward, encouraging governments to privatize their water companies in an effort to modernize technology and decrease water usage.

As part of this "shock", water specialists implemented water privatization in both La Paz and Cochabamba, Bolivia. Without the specification of water rights that Chile implemented, the water rights in Bolivia were property of the government to grant to the new water companies as it saw fit which gave those companies universal and undeniable rights to all water resources in the cities. In both cases, water privatization sparked social movements (in the early 2000s) that in turn ousted the international companies from Bolivia in the hopes of returning water to a national right. The Bolivian government had struggled to provide its citizens with water at an affordable price, and in an effort to spark investment into water infrastructure as well as meet World Bank

and International Monetary Fund stipulations for international aid, it implemented water privatization along with the privatization of most public resources in the late 1990s (oil, gas, energy etc.). This included closing mines, which resulted in 31,000 public servants being laid off and the elimination of the power that the labor unions and movements held. Also, as part of this program, NEP architect Gonzalo Sánchez de Lozada pushed the privatization program which he called “capitalization” in 1993 when he was elected president, in which he moved to privatize most public utilities, including gas, electricity and water (Spronk 2007: 10).

As a result, the government sold half of the shares of public utility companies to foreign companies, and the other half to private Bolivian companies (Spronk 2007). La Paz, the biggest city in Bolivia underwent its privatization process in 1997, two years before the implementation of the Cochabamba privatization. *Aguas del Illimani*, a French company, won the bid for the La Paz/El Alto concession, which gave it water rights for 40 years (Laurie and Crespo 2007: 843). In both cases the government entered a “concession” with the foreign private companies, defined by Cohen and Peterson as an agreement between the government of a nation and a private company (Cohen and Peterson 1999: 89).

Servicio Autónomo Municipal de Agua Potable Alcantarillado de la Paz (SAMAPA), the water company of La Paz (Bolivia’s largest city) underwent a privatization process in 1997. *Aguas del Illimani*, bought water rights within La Paz with concessions allowing them undisputed water rights for 40 years (Spronk 2007). The concession signed by *Illimani* and the Bolivian government included requirements for investment by the company into the water system in order to improve infrastructure and expand water access to more citizens (Laurie and Crespo 2007). The price system *Illimani* implemented was intended to charge citizens only for water they used and included a price system similar to that of EMOS in that there were different prices for users

with higher consumption than those of lower consumption. There was a problem with water meters however, and poorer households often paid a minimum charge that significantly exceeded their water usage, and therefore was too expensive for citizens (Laurie and Crespo 2007).

In 1982, 65% of the population of La Paz had access to the public water system. In 2001, that number increased to 84% of the city's population (Poupeau and Hardy 2016). Although the water systems grew to reach more people, these numbers only include the La Paz "served areas" because *Illimani* focused on the profitable areas of the city (Spronk 2006). *Illimani*'s contract was considered "pro-poor" because the number of connections to the water system increased during their tenure as water system monopolist, regardless of where those connections were made.

Here, a "territorially-based" organization, known as the Federation de Juntas Vecinales de El Alto (FEJUVE), gained traction as it demanded the return of water rights to the public. In 2000 FEJUVE organized "all out" strikes across the La Paz-El Alto concession, forcing the government to meet with the organization to reach an agreement (Poupeau and Hardy 2016: 844). Their cries were not heard however until 2004 since *Illimani* admitted to showing false evidence of "expanding" the water systems beyond what it was previous to their arrival (Poupeau and Hardy 2016).

The contract that the Bolivian government signed with *Aguas del Illimani* is considered a "pro-poor" water concession. This distinction was awarded to the contract for its mandate for the extension of water services and water tariffs based on consumption (Laurie and Crespo 2007). The mandate for expansion was intended to require the company to invest in the expansion of infrastructure and services to a larger area and therefore a larger amount of people, in an effort to include poorer neighborhoods. Tariffs based on consumption would allow people who use less water (usually in poorer neighborhoods) to pay lower water bills than those who used more

(usually in richer neighborhoods). The problem with this system was that the water meters often did not accurately measure the amount of water usage, or not many poor households had water meters. Therefore, poorer households were required to pay a minimum usage fee that was significantly higher than it would be if they had been charged only for the water they used (Laurie and Crespo 2007).

In 1999, the government sold the Cochabamba water systems to *Aguas del Tunari* in an effort to increase water infrastructure and water availability for the peripheries of the city. Law 2029 granted *Aguas del Tunari* exclusive and monopolistic rights to all water resources within the Cochabamba area, which would also come to include the surrounding territory (Spronk 2007). The contract between the government and the new foreign private company included commitments on the part of *Tunari* to expand the water network to a larger area, in order to include the peripheries of the city with the poor citizens. It also, however, guaranteed the company profitable returns for 40 years. On top of this, the World Bank specified that no public funds were to be used in the expansion of the water system in the interest of full market potential. Since no government funding could be used, all of the profits guaranteed to *Tunari* for 40 years had to come from the citizens in the name of increased rates. Not only were people charged higher rates for water services from *Tunari*, but citizens who lived outside the boundary of Cochabamba, who had constructed their own wells and water systems, were charged for their water also.

At the time of privatization, only half of the population was connected to the public water system (Spronk 2007). *Aguas del Tunari* did not expand the water infrastructure as promised and the price hikes of up to 200% for water meant fewer people had access to water. The government of Cochabamba never offered any solutions to the outraged people and in 2000 social

movements succeed in kicking the company out of the country. With people out of work and therefore out of workers' unions, they formed alliances according to their neighborhoods. Neighborhood leaders rallied people in the name of injustice as the access to water was categorized by geographical location. These citizens, who worked as domestic servants, street vendors and casual laborers joined together to fight the privatization of their water system and reclaim their rights to water.

Susan Spronk, a professor of International Development and Global Studies at the University of Ottawa, describes in her "Roots of Resistance to Urban Water Privatization in Bolivia: The 'New Working Class' the Crisis of Neoliberalism and Public Services" a new form of union, as a union of neighbors rather than a union of coworkers. As such, when the protesting union Coordinadora succeeds in removing *Aguas del Tunari* as the owner of water rights within Cochabamba, they were unable to set up a system that successfully allocates water resources to the citizens of the city. The Coodinadora's efforts to solve the water crisis were thwarted as customers demanded lower prices for water and workers within the water system demanded jobs. Cochabamba struggled between the growth of water services and the decrease in costs, all without the capital to solve either one. To add insult to injury, in 2005 the Inter-American Development Bank required the water system to employ less people as a contingency for receiving international aid. Additionally, *Aguas del Tunari* sued the Cochabamba government for the \$25 million they should have made in profit for the investment they made into the company. All of these discontinuities added to the water crisis in Cochabamba in the early 2000s (Spronk 2007).

La Paz Water Availability

Although the price hikes and social movements in La Paz were not as dramatic as those in Cochabamba, I analyze the results of the water privatization scheme in La Paz to see how even the “pro-poor” concession did not successfully provide water to all of the city’s citizens. In both cities, international interference in the water sector led to social movements that demanded the human right to water in the face of economic stagnation even with the new neoliberal capitalist water systems.

The results of water privatization in La Paz Bolivia are mixed. The pro-poor contract between *Aguas del Illimani* and the Bolivian government required the company to expand water infrastructure to more citizens. The lack of specificity in this requirement, however allowed *Illimani* to increase the number of household connections in accordance with the contract without expanding water access to citizens in poor neighborhoods. The contract did not specify geographical requirements for the connections and therefore gave *Illimani* the opportunity to expand only where profits could be found (Laurie and Crespo 2007).

The Bolivian government sold all water rights to *Aguas del Illimani*, a French water company, in an effort to bring water expertise into the area and expand its water system in La Paz and El Alto. Spronk explains that El Alto was the poorest and most indigenous city in Bolivia at the time of privatization and therefore there were 200,000 people in El Alto that were not included in the city’s “served area” for the water system. This meant that the water company drew a line around La Paz and El Alto that excluded the peripheries of those cities. Furthermore, according to Spronk, there were 70,000 people that were inside the “served area” but could not afford the water supplied by *Aguas del Illimani*.

Table Two shows the results of the attempted privatizations in terms of changes in access

to improved water and sanitation systems for households in Cochabamba and La Paz. The number of households in Cochabamba served by the water system increased from 44% to 63% between 1992 and 2001, a 19% increase (World Bank 2004: 173). The same city experienced increased access to improved sanitation systems, from 45% in 1992 to 67% in 2001, a 21% increase. The table also shows that La Paz experienced similar results. Access to improved water services increased 14% and access to improved sanitation systems increased 20% (World Bank 2004: 173).

Table 2: Percent of households with access to improved water and sanitation systems in La Paz and Cochabamba

City	% of households with access to improved water systems			% of households with access to improved sanitation systems		
	1992	2001	increase	1992	2001	increase
Cochabamba	44	63	19	45	67	21
La Paz	58	72	14	37	57	20

Source: World Bank 2004

Some critics claim that the “growth” as shown in these numbers does not account for the peripheries of the cities (Poupeau and Hardy 2016: 2). This is significant because the population of El Alto, the satellite city of La Paz, increased from about 250,000 in 1985 to 650,000 in 2001 (Spronk 2007). Data shows that *Aguas del Illimani* succeeded in expanding improved water systems within the “served area” of the contract, but this area did not include the majority of the periphery citizens. Parts of El Alto were considered inside of the “served area,” however, 200,000 people lived outside the “served area,” and without recognizing these people in the data above, the percent increase would be significantly less (Spronk 2007: 20). Table 3 shows the

increase of densification instead of expansion of water connections in El Alto, meaning that the number of connections increased within areas that were already serviced, instead of expanding to new areas.

Table 3: Domestic potable water and sewerage connections in El Alto (up until 2006)

El Alto	Coverage by 2006 (%)	Densification	Expansion	Difference (in %)
Domestic potable water connections	100	21,001	5,327	80/20
Domestic sewerage connections	100	6,500	7,321	47/53

Source: Laurie and Crespo, 2007

The table separates the number of sewerage and potable water connections until 2006 into two categories: “densification” and “expansion”. Densification indicates the connections that were created within areas of the city that already had houses connected and did not have trouble with water access. Expansion indicates that the new water connections expanded beyond the reach of the water infrastructure before the privatization of the water company. The “difference in percent” is the percentage of the new connections that are classified as “densification” versus those that are considered “expansion”.

The table also shows that 80% of the growth in potable water connections was actually only densification within areas that were already served and 20% classified as expansion, instead of expanding the water system to reach more people. Essentially, 80% of the new connections that *Aguas del Illimani* created were in areas that already had access to potable water before privatization, and only 20% of the new connections were in areas that were not previously

provided water access through the municipal water lines. These data show that *Aguas del Illimani* focused its investment in areas that it could make more revenue by selling water to them and ignoring the areas of the city that did not already have access. The “expansion” that *Aguas del Illimani* was required to reach in the contract signed with the Bolivian government was not in fact the expansion that was intended by the pro-poor contract.

Table 4: Water and Sanitation Coverage by Type of Supply (Percent of Households)

	1997			2001		
	Total	Urban	Rural	Total	Urban	Rural
Water						
Improved	71%	94%	37%	72%	90%	44%
House connections	19%	31%	2%	29%	43%	6%
Yard connections	46%	58%	27%	39%	45%	29%
Standpipes	6%	5%	8%	4%	2%	9%
Other	29%	6%	63%	28%	10%	56%
Sanitation						
Improved	59%	78%	31%	67%	84%	40%
Sewerage	29%	46%	2%	31%	48%	3%
Septic tanks	10%	14%	3%	10%	14%	4%
Pit Latrines	21%	18%	26%	26%	21%	34%
Other/ without service	41%	22%	69%	33%	16%	60%

Source: World Bank 2004

Table 4 has a breakdown of each type of water source implemented for all of Bolivia. It shows that while there was an increase in access across the board, there were more connections added than people who gained access from the privatization. According to The World Bank’s Bolivia Public Expenditure Management for Fiscal Sustainability and Equitable and Efficient Public Services report, the 4% decrease in percentage of people with access to improved water coverage in urban areas from 94% to 90% between 1997 and 2001 is accounted for by the

significant increase in urbanization during that time period (World Bank 2004: 174). The 200,000 people that lived outside of the “served area” in El Alto are a part of the population that caused the percent decrease shown in the table.

In the case of La Paz, Franck Poupeau and Sébastien Hardy disagree that population increase is the only reason for a 4% decrease in household accessibility. In their article, “The social conditions of self-organized utilities” water cooperatives in La Paz and El Alto, Bolivia” they claim that the decrease in percentage in overall water and sanitation coverage is not only from an increase in population, but also a conscious decision on the part of *Agua del Illimani* to invest in areas within the city in which profits were guaranteed. These profitable areas landed within proper city limits, that the company had the privilege of dictating, and therefore were the only areas considered when its contribution to the expansion of water systems was measured (Poupeau and Hardy 2016). As such, the company increased the number of household connections, but only in the wealthy areas of the city so that the poor peripheries were left out of the improvements they helped build (Poupeau and Hardy 2016: 9). The World Bank Report supports this theory when it explains that “richer households are almost two and a half times more likely to have water and sanitation services compared to households in the bottom quintile” (World Bank 2004: 174). This disparity in income and access to water and sanitation services is shown in Table 5.

Table 5: Access to Water and Sanitation-Distribution of Households by Income in La Paz, 2001

(Percent of households in quintile with access)

	Poor 1	2	3	4	Rich 5	Overall
Improved Water Coverage						
Total	36	59	71	80	88	72
Urban	76	83	87	88	95	90
Rural	26	34	39	52	59	44
Sanitation service coverage						
Total	34	60	69	82	91	67
Urban	73	76	80	88	95	84
Rural	26	44	48	65	69	40

Source: World Bank 2004

This table shows the difference in access to water and sanitation service coverage in relation to household income. Not only is access within the urban sector higher than the access for people in the rural sector, 90% of households compared to 44% of households respectively, but access for people in the bottom quintile of the urban sector is 19% lower than that of the top quintile, 76% and 95% respectively. The income gaps between citizens within each sector and between citizens in different sectors correlate with the amount of water access. This can be explained by location, as people with different incomes reside in different areas of the city and therefore *Aguas del Illimani* focused on the areas of the city that had higher incomes in order to make more profit for itself.

The World Bank Implementation Completion Report of the Major Cities Water and Sewerage Rehabilitation Project specifies the priority level of the sewage implementation as higher than that of the potable water priority. The political uprisings against *Illimani*, however, were not because of the sewerage connections, they were because of the price hikes in water

during their tenure in La Paz and El Alto (Spronk 2007). While sewerage infrastructure is important for the overall health of citizens in a city, potable water access is important as well. The social movements that resulted in the Bolivian government ousting *Aguas del Illimani* were movements fighting for water access, not for sewerage infrastructure. This shows that water access is on the forefront of citizens' minds and therefore should be a financial and investment priority.

Results of Water Policy

The privatization of the water system in Bolivia caused price hikes both before and after the actual sale to *Aguas del Illimani*. In December 1996, the government increased the prices by 57.7% in “preparation” for the sale in order to pad the price hikes again after the purchase (Laurie and Crespo 2007). The water privatization in La Paz is considered to be “pro-poor” and as such the price system was set up in a way to protect the poor from paying too much in water bills. Table 6 shows the price set up for *Aguas del Illimani* and its goal to charge users who consumed higher volumes of water higher prices than those who used smaller amounts of water.

Table 6: Water Usage Prices for *Aguas del Illimani* and SAMAPA

Water Usage	Value (\$US/m ³)	User Category (m ³)		
		Domestic	Commercial	Industrial
<i>Aguas del Illimani</i>				
High	1.1862	301 or more	21 or more	1 or more
Medium-High	0.6642	151 to 300	1 to 20	
Medium	0.4428	31 to 150		
Low	0.2214	1 to 30		
SEMAPA				
High	0.9964	301 or more	21 or more	1 or more
Medium-High	0.5579	151 to 300	1 to 20	
Medium	0.3719	31 to 150		
Low	0.9964	1 to 30		

Source: Laurie and Crespo 2007

As is shown in the table, *Aguas del Illimani* charged \$1.1862/m³ for users that used higher volumes of water (301 or more m³) while SAMAPA, the public water company before privatization, only charged \$0.9964/m³ to those same users. *Aguas del Illimani* charged medium-high (151 to 300 m³) volume users \$0.6642/m³ and SAMAPA would charge the same customers \$0.5579/m³. The trend continues for Medium volume (31 to 150 m³) users but switches for Low

volume users. SAMAPA charges low volume (1 to 30 m³) users \$0.9964/m³ just like the High volume users while *Aguas del Illimani* charges \$0.2214/m³ to the lowest volume users.

These prices support the “pro-poor” classification of *Aguas del Illimani*, giving higher prices to those users that can supposedly afford it as they use higher volumes of water and giving price breaks to those users that cannot afford to use much water. The problem that Laurie and Crespo found in their article “Deconstructing the Best Case Scenario: Lessons from Water Politics in La Paz-El Alto Bolivia” is that there were no water meters in the areas in which the poor lived (Laurie and Crespo 2007: 846). Therefore, the lowest users were having to pay a flat rate regardless of water usage, preventing them from taking advantage of the decreased water prices. Within El Alto, the households with meters paid between \$0.75 and \$0.88 USD monthly per connection, reflecting their low usage, in comparison to the houses without meters that paid \$2.38 USD monthly per connection (Laurie and Crespo 2007:846).

Laurie and Crespo continue to unearth hidden costs for water consumers in the “pro-poor” concession in La Paz and El Alto. They explain that the charges for water include the 2% state regulation tax, the monthly billing costs (which increased from \$0.1 to \$0.22 USD between 2001 and 2005), and the “dollarization of tariffs” also hid the 35% increase in real costs between 1997 and 2004 (Laurie and Crespo 2007). All of these hidden costs together with set rates without water meters explain how five percent of periphery household budgets, in neighborhoods such as Alto Tembladerani, are spent on water access (Poupeau and Hardy 2016:11).

The increase in prices combined with the lack of transparency in the *Aguas del Illimani* contract to create an unsatisfied public and eventually the ousting of the company. Between opening the bidding for the sale of the water system in La Paz-El Alto and *Aguas del Illimani* signing the contract, prices increased by 20% (Laurie and Crespo 2007). These price hikes

amounted to \$3.6 million USD in profit for *Aguas del Illimani* and projected profits of \$157 million USD in the 30 years the company was contracted to control the water systems in La Paz-El Alto (Laurie and Crespo 2007). An important factor to compare in the contract that *Aguas del Illimani* signed is that the water regulator and the company were the only two parties involved in the creation of the contract. The Water Regulator and the Sanitation Superintendent were also the same person, so it was easy for the Water Regulator to team with *Aguas del Illimani* for the most profit rather than the best interests of the citizens (Laurie and Crespo 2007:850).

The privatization movement in Bolivia included services other than water (electricity, gas etc.) and in the process, by recommendation of the World Bank, decreased their labor significantly, leaving over 31,000 public service workers without jobs throughout the country (Spronk 2007). When laying off these workers, companies offered to allow workers to buy the “preferential shares” in the newly privatized companies, however the shares owned by Suez, the World Bank and Banco Mercantil gained more interest, meaning that the laid off workers only gained 5 bolivianos (under \$1 USD) each year (Spronk 2007: 20).

Bolivian Ecological Story

Bolivia’s water system, already plagued with economic inefficiencies, is also suffering ecological problems. Late last year, 2016, the Bolivian government declared the lack of water a national emergency as they suffered their worst drought in 25 years. Rationing was implemented and citizens only have access to water for three hours a day (Walker 2016). In January 2017, news sources reported a two-month water shortage in La Paz (Martinez 2017). As in Chile, pollution, climate change and lack of infrastructure cause the citizens to experience extreme water shortages and rationing throughout the year. La Paz is the largest city in the world at its

altitude of 4,000 meters, making the city's options for water limited while also creating a dangerous living situation for the people who live in the periphery. The steep slopes that surround La Paz make for settlements that are at risk of landslides in the event of heavy rainfall and earthquakes, but they also have a unique problem in the logistics of water provision. Water infrastructure often depends on gravity to carry water to homes, and the steep peripheries make infrastructure hard to build.

The drought Bolivia is currently facing has two of the three water reservoirs for La Paz down to 8% capacity, the third reservoir resting at 1% capacity (Walker 2016). In 2016, Lake Poopó dried up, costing the country its second largest lake and water source. Many people blame the overuse and pollution of water resources on the mining companies that operate upstream from the lake, causing the lake to desiccate (Martinez 2017). This is just one example of the ways Bolivia is suffering water scarcity.

Glaciers are the main source of potable water for the city of La Paz, the majority of which are shrinking worldwide. The glaciers of the Cordillera Real mountain range around La Paz supply the city with up to 40% of its water supply (Rangecroft, Harrison and Anderson 2015). Between 1987 and 2010, the glacier coverage in the mountain range decreased by 34.5% (Liu, Kinouchi, and Ledezma 2013: 162). This decrease in size leads to less water resources for the country to draw from in order to supply it to its citizens. Furthermore, the "accepted notion that a glacier retreats faster as it becomes smaller" should be taken into account, predicting that water scarcity is only going to worsen in coming decades (Liu et al 2013: 162). It is estimated that two of the glaciers that feed the La Paz water supply will disappear by 2030 (Walker 2016).

In order to supply La Paz with water in the future, the government will most likely have to invest heavily in water reservoirs as well as desalinization plants. Water is heavy and hard to

transport, especially with the city being as high in altitude as it is. Desalinization is expensive but it would offer an alternative for the mining companies that use large volumes of potable water. Larger reservoirs would help collect the rainwater that until now has been wasted by being allowed to flow away from the city. Also, if the Bolivian government could keep pollution out of Lake Titicaca, it may be able to use those water resources to provide for La Paz.

On top of growing glacier thinning, the urban expansion of the city is threatening the water quality of the Katari watershed. The Katari watershed feeds both La Paz and El Alto and empties into Lake Titicaca. El Alto, home to around 5000 industries, has wastewater collection and wastewater treatment plants to cover 50% of the wastewater it produces (Archundia et al. 2017: 4). Subsequently the water that passes through the city to reenter the watershed has seven times the natural river flow including high bacterial activity and high nutrient levels (meaning high levels of phosphate and ammonium) (Archundia et al 2017:14). The main reservoir for the city of La Paz is the Milluni Lake, which receives its water from the glaciers in the Cordillera along with the wastewater from mining plants farther upstream. The wastewater in the Seke River (part of the Katari watershed) causes the water meant for La Paz citizens to be extremely acidic (Archundia et al 2017), “the whole Katari watershed, from downstream Milluni Valley to Cohana Bay, appeared not to be suitable for any type of activity, be that drinking water for humans or cattle or for irrigation purposes” (Archundia et al 2017: 44). Furthermore, the La Paz river basin suffers from the deforestation that has been increasing by 2 km² a year since 1991, which leads to increased runoff from the nearby land, including farms, and causes water pollution from the dirt as well as the chemicals used for agriculture (Escurra, Vazquez, Cestti, De Nys, and Srinivasan 2014: 735).

The reason for bringing attention to water scarcity in Bolivia is to show that water policy needs to be monitored and modernized in order for places in areas such as this to continue to have access to water. The nature of water as a natural resource and an absolute necessity for human life will cause it to be the most controversial product on Earth very soon. Even though the Bolivian government could not successfully implement privatization in the water sector, Bolivia, and La Paz are experiencing the same problems with water scarcity as Santiago, Chile. My analysis will look at these two cases as they pertain to privatization and water scarcity as these countries look forward to supplying water to their increasingly growing cities.

The water scarcity that both Santiago and La Paz are experiencing may not be a direct result of the water privatizations in each city, but it is obvious that water privatization is not a solution to water scarcity. Whether water privatization led to social uprisings or a successful water market and fair allocation of resources, neither system achieved water scarcity protection for its citizens. Today, governments can no longer avoid this part of water policy. Water scarcity will need to be addressed soon in order to provide for the large populations in Santiago and La Paz.

ANALYSIS

With this thesis I wanted to answer the question: Why has Bolivia had so many problems with water availability? As I looked into water availability and water policy in Latin America I found that Chile, Bolivia's neighbor was able to implement a major water market privatization effort. After finding this I wanted to know how Chile had managed to implement these changes so fluidly while Bolivia's policy change resulted in what is called the "Cochabamba Water War", which subsequently spread to La Paz and resulted in the expulsion of the international water companies in both cities. The abrupt privatization and sale of the water utility in La Paz to an international company caused a surge in prices that resulted in revenue for the company that was not distributed throughout the city to benefit all users. The water policy changes in Santiago before the implementation of water privatization in 1999 provided universal water access for its citizens and allowed for the transfer to privatization to go smoothly. The smooth transition in Santiago however did not create a system in which the sustainability of water resources was protected. Neither water framework resulted in the decreased water use. Water scarcity should be the focus of the water frameworks moving forward in water policy thought. Through my research I have discovered why the privatization of water resources did not succeed in Bolivia, and why water policy change in Chile was successful and the subsequent privatization of water resources did not cause the same social unrest as it did in Bolivia.

First, the international aid packages offered to each country in the time of water system rehabilitation and privatization should be take into account. The World Bank gave significant packages to both Bolivia and Chile in an effort to help them improve their water systems. By looking into the specific projects we can see that the projects implemented in Santiago and La Paz show a significant difference in financial aid. The first aid package given to EMOS in 1980

was 65 million US\$ while the package granted to La Paz, Cochabamba and Santa Cruz in Bolivia in 1990 totaled 35 million US\$ (Pflieger 2008: 32) (World Bank 1998: i). Chile also received a second package for continued water system improvement in 1986 for an additional 53.68 million US\$, this project specifically for Santiago (World Bank 1996: 1).

The Bolivian project in 1990 did not have as much revenue nor as much success as the Chilean projects. The World Bank ICR of the 1990 Major Cities and Sewerage Rehabilitation Project describes that by the project end date in 1996 “the water company of La Paz and SEMAPA, the water Company of Cochabamba, had barely initiated the implementation of their components, which were only completed after two extensions of closing dates” (World Bank 1998: iii). With the extensions of a year and six months, SEMAPA had completed the original project goals but not in Cochabamba (World Bank 1998).

Second, the two Chilean water system projects were dedicated solely to Santiago and were installed before the privatization of the water company. This allowed EMOS to invest directly into the expansion of the water system which provided access to more citizens instead of just profit for the company. That being said, by the second project in 1986, EMOS was funding itself from the revenue it was making from the changed price system it implemented in the early 1980s

After the limited success of this project by 1996, the World Bank conditioned the extension of the loans on the privatization of SAMAPA during that time (World Bank 1998). Therefore, the Bolivian government had signed a concession with *Aguas del Illimani* before the end of the project, and before any real price system or company reorganization could take place. Bolivia sold water the La Paz company to an international company by signing a concession in which the government granted the company full water rights for 40 years.

The difference here between Chile and Bolivia is that the Bolivian government brought privatization to its water systems as a requirement set by the World Bank who wished for it to be the solution to its water system inefficiencies. Chile on the other hand, implemented significant changes to assure universal water access throughout Santiago before allowing the water company to be privatized. The privatization of SEMAPA in La Paz led to the incentive for profit over water provision to the citizens while EMOS, with the financial autonomy given to it by the World Bank, was able to focus on the water provision for its citizens within Santiago.

Even though the Bolivian concessions had “pro-poor” requirements in the contracts, *Aguas del Illimani* was able to find a loophole in the requirement for expansion by only increasing the amounts of connections within the rich neighborhoods in order to make a profit rather than increase water access for poor citizens. The sale of the Bolivian water company to an international company created the commodification of water, ignoring the social aspect of water resources. The immediate transition into privatization of water resources is what prevented the sustainability of the water system in La Paz because the new company implemented price changes that that would fund expansion as well as generate revenue for the company.

Third, the price hikes in La Paz happened rapidly as the government increased prices 57.7% in 1996, in preparation for privatization. The subsidized prices came with *Aguas del Illimani* instead of with SEMAPA, so the profits went directly to the company rather than to a government entity with the goal of increasing access to all citizens.

In contrast, Chile changed their water systems over a course of 19 years (1980 to 1999), so the price fluctuations happened slowly over time, and were also mitigated by subsidies included in the system for poor users. In the 1980s EMOS began the price system in which the higher prices for higher usage subsidized the lower prices for the lower usage so that when, in

1990 the average price of water was 50% higher than in 1989, wealthier water users had already adjusted to higher water prices. The subsidized price system was made possible by CORFO, a national company with a mission to spark economic development in Chile, rather than an international company focused on revenue.

Fourth, Chile also had the Superintendencia de Servicios Sanitarios (SISS), the autonomous entity responsible for naming rates, supervising technical norms, and maintaining quality control (Pflieger 2008). The SISS regulated water companies throughout Chile and was in place before the privatization in 1999, so it helped hold both EMOS and then Aguas de Barcelona-Suez after privatization accountable for water supply to all citizens. By setting prices it gave the companies incentives to remain efficient in order to keep its prices below the set price in order to make a profit but also allowed them to make profits if they functioned efficiently enough for their cost of production to be lower than the set price.

In contrast, the lack of transparency between *Aguas del Illimani* and the Bolivian government allowed the company to falsify data that described the reach of the water system and contributed to the corruption between the water superintendent (responsible for deciding what the water company can and cannot do in order to provide universal water access for citizens) and water regulator (responsible for managing the concessions between the government and the water company in order to hold company to contract) who in the case of Bolivia were the same person, and the company (Laurie and Crespo 2007). The water superintendent/ water regulator permitted *Illimani* to change prices as it pleased since the superintendent/regulator was the only one the company had to answer to on behalf of the Bolivian government (Laurie and Crespo 2007). Corruption led to the revenue that the company made from the higher prices not being

invested into the water infrastructure to bring water to more citizens, but rather turning into profits pocketed by the company and water superintendent.

Fifth, the relative economic statuses of Bolivia and Chile at the time of water policy change may have impacted the level of success of the implemented changes. The Bolivian GDP in the year of privatization for La Paz, 1997, was 7.926 billion (current US\$) while the GDP in Chile the year of water policy changes, 1980, was 27.572 billion (World Bank 2016). Chile had much more capital to invest in its water system and therefore could leverage more power in the process of water policy changes. Bolivia on the other hand needed much more financial aid and therefore was unable to dictate the conditions of the aid the World Bank granted it and subsequently the concession it signed with *Aguas de Illimani*.

By the time the foreign consortium Aguas de Barcelona-Suez bought 51% of the shares in 1999, EMOS had already set the framework for the company so that it was making profits while still supplying affordable water to all of the citizens in Santiago. Essentially, unlike in La Paz, privatization of EMOS was not driven by the desire to spark international investments to expand water access, instead water access expansion was achieved by national investment and national company reconstruction and privatization was the result. After the rehabilitation of the water system by EMOS in the 1980s and 1990s, Aguas de Barcelona-Suez bought 51% of the shares for 960 million US\$ (Pflieger 2008). EMOS's revamping of the water system in Santiago increased the water company's value and led to the foreign direct investment that the Bolivian water privatization project aimed to obtain.

In the debates arguing for the privatization of water resources such as those presented earlier by Maestu and Perry et al. many of the problems that they aim to solve by implementing privatization remained in problems after the privatization of the water systems in Santiago and

La Paz. One of the problems Perry et al. introduced as a result of water being controlled by the public sector is corruption. The research I have done shows that even with privatization in La Paz, corruption remained a problem, and Santiago was able to avoid corruption with its autonomous body, the SSIS. While privatization did bring foreign direct investment into La Paz and Santiago when their water companies were sold to international companies, it did not encourage users to limit their usage (Santiago) nor did it give those water companies the incentive to expand water supply while improving water service. A successful example of the subsidized price system proposed by Perry et al. is seen in the Santiago case with EMOS *before* privatization. Water prices in Chile in 2012, after privatization, were recorded as the highest in Latin America, showing that privatization did not result in affordable universal potable water access (Bland 2013).

The privatization of water resources in La Paz resulted in the expulsion of *Aguas del Illimani* while the results of the privatization of EMOS are still being seen today. *Aguas Andinas* provides water to 6 million of the 7.2 million citizens in Santiago, with water prices higher than any other in Latin America (Gallagher 2016: 1). According to Francisca Fernández, spokeswoman of *El Movimiento por la Recuperación del Agua y la Vida*, “privatization of water has kept prices unnecessarily high, delivered poor service and done little to address concerns over insufficient supply in the future” (Gallagher 2016: 1). Protests as large as 2,000 people in the streets of Santiago are evidence that the privatization of EMOS in Santiago has not had the results experts hoped it would (Gallagher 2016).

My research supports Cohen and Peterson’s ideas of institutional pluralism. EMOS in Santiago is the case that most closely resembles institutional pluralism. The SSIS dictated the market, setting prices so that EMOS and other water suppliers had to provide affordable water

access to the citizens of Santiago. Furthermore, the public company was directly invested in the development of Santiago as a city and therefore focused on water provision rather than profit. The price system allowed for wealthier users to subsidize the water access of poorer users and the profits were reinvested directly into the water sector in order to continue the expansion of water access for citizens of Santiago. In order for people to retain their water access, no one entity can be in charge of water allocation. Water is too precious of a resource to be turned into solely and economic good, the social ramifications must be considered and water resources must be protected.

Ecological Issues and Mounting Problems of Scarcity and Pollution

Although Chile was able to create a water system within Santiago that allowed water allocation to all of its citizens before privatization, the privatization of water the water system in 1999 did not bring about the protection of water resources like many supporters of water privatization believed would happen. Instead, the private companies are more interested in the profit from increased water sales over the sustainability of water resources. The water privatization in Bolivia, even though it failed, did not lead to reduced water use either.

Glacier retreat has continued in both areas and the cities are starting to see the results of this decrease in water resources. Citizens of La Paz have days without water and their drought has been deemed a national emergency (Walker 2016). Citizens in Santiago suffer days without water as high rainfall causes flooding of the river basin and the contamination of their water resources. The privatization of water resources in Chile and Bolivia did not serve its purpose as a solution to water scarcity, nor did it cause investment into preventative measures to protect their water resources from contamination. The physical delivery of water resources is no longer the

only concern for governments anymore, the prevention of water scarcity is becoming more important as climate change and pollution threaten water resources.

Mining companies are using high percentages of water resources as well as contaminating water resources for citizens (Aitken, Rivera, Godoy-Faúndez, Holzapfel 2016). The governments of Chile and Bolivia both need to focus resources on finding alternate resources for the mining companies to use and/or limit their use of clean water as well as control their proximity to the big metropolitan areas. Mining companies are contributing significantly to the water scarcity problem in both cities as they are generally placed uphill from the cities and their discharge affects both water quality and quantity.

In Santiago, Chile, where the privatized water company *Aguas Andinas* has had control over the water systems since 1999, we can see how privatization has not led to reduced water usage by consumers. Data show that consumers use on average 53,000 m³ of potable water per person per year, which is twenty-five times more that is needed for sustainable development (Lagorio 2014b: 1). These data are evidence of what Lagorio calls the “over-exploitation of water basins and a misuse of water rights” that has taken place in Santiago since the privatization of EMOS in 1999 (Lagorio 2014a: 1).

As discussed earlier, Hoekstra et al. shows the importance of water footprints in the overall picture of water resource sustainability. If cities overuse their water resources, the ecological health of the river basins will be threatened and water scarcity will ensue. This is the process we can see today in Santiago and La Paz. Water resources are becoming scarce as glaciers retreat and growing populations put more strain on water resources. Since urban populations are growing, decreasing water usage is not enough to protect water resources. A decrease in excess water use would help protect water resources, but if water provision for basic

necessities creates a water footprint that negatively affects water resources in the vicinity of a city, then more measures need to be taken to ensure water resource sustainability.

Chile is looking into desalinization plants for mining companies in order for freshwater resources to be used solely for citizens' use. Josefina Maestu discussed desalinization as a solution to water scarcity and California's efforts to use it to provide water to its citizens since the state has been facing water scarcity for years (Maestu 2013: 50). Desalinization is the process of removing salt, and other chemicals from water to produce fresh, potable water. The problem Californian cities faced is that desalinization also includes the desalinization of wastewater. While recycling water resources would be an ideal solution to water scarcity, the general public, once they realized that their drinking water was recycled wastewater, they protested desalinization as an acceptable form of water service (Maestu 2013).

Maestu's book also covers solutions such as underground water storage, recycled municipal water and urban conservation. Underground water storage would allow water to be collected in the rainy seasons and stored until its use in dry seasons. It is an environmentally friendly option that can be stored and used in different areas. One of the worries however is contamination from surface water runoff. Additionally, draw and recharge speeds are dependent on gravity and rainfall patterns (Maestu 2013).

Recycled municipal water would allow used water to be used for purposes that do not necessarily require potable water, such as landscaping and outdoor cleaning. Water recycling however would require significant investment into new infrastructure as water with different levels of quality would require different plumbing. There is also a questions of public safety as children play outside and environmental effects as runoff would not go to treatment plants and water could potentially contaminate river basins (Maestu 2013).

Finally, urban conservation is the idea of preventing excess water usage through education and water usage regulations such as fees for overuse. This form of water conservation is best aligned with Bichieri-Colombi's WINE framework. These methods are both centered around the idea of decreasing water usage by a change in public thought as it pertains to water. If these ideas were implemented in Santiago and La Paz, the wealthier users would not be able to consume more water than is necessary for hygienic use. Water planners would be "decision makers over the Earth" and water would no longer be considered a commodity but instead a luxury.

In the privatization framework, water resource sustainability was expected to come as a result of market forces decreasing water consumption. Decreased water usage however, was not a result and privatization actually led to the over-use of water resources (Lagorio 2014b). Institutional pluralism would allow multiple regulatory bodies to dictate water usage as the government, as well as public and private companies would be required to operate under a mandate for decreased water usage. Autonomous bodies such as the SSIS would enforce market restrictions in which companies would only be allowed to sell a certain amount of water, but market forces would allow each company to compete to keep water prices low for citizens. The government would most likely have to subsidize this form of water market, but the sustainability of water resources and therefore the sustainability of each society would be the benefits of such a framework. Desalination, although expensive, may be a required action for La Paz as the city's water resources become scarce and the population continues to grow. Santiago has access to more water resources so it may be able to reach water resource sustainability by implementing a myriad of these proposed strategies.

CONCLUSION

This study has analyzed privatization as a solution to water allocation in urban settlements as well as a solution to increasing global water scarcity. In order to answer this question, I focused on secondary sources that have analyzed the economic and social results of water policy changes in Santiago, Chile and La Paz, Bolivia as they pertained to water privatization. Previous research has been conducted on the effectiveness of privatization in economic and social contexts in Chile and in Bolivia but the two have not been compared nor has research examined the ecological results of privatization.

I started my research by investigating the Cochabamba Water Wars and the water policies that led to social unrest since this is a representative example of problems with water access within Bolivia. As I looked into the water policy changes in Bolivia I found that the water privatization in La Paz lasted longer than the attempted privatization in Cochabamba and therefore had more potential for understanding the individual aspects of the policy changes. The majority of the literature on the privatization of water in Bolivia is critical of the attempted privatization, as it did not provide water access to all of its citizens. The literature on water scarcity of the area is minimal and empirical, showing the causes of water scarcity, but does not connect water scarcity to water policy. The literature that connects privatization to the prevention of water scarcity treats ecological effects as a “bonus” to water privatization in addition to achieving efficiency of water allocation through the market.

When trying to find a way to improve the water systems in Bolivia I was directed towards the water market in Chile as it is only one of three countries that separates water rights from land rights, allowing water rights to be treated as an economic good. The water projects that were implemented with the loans given by the World Bank, succeeded in providing water access to

more citizens at an affordable price. Through secondary sources I researched the water policy changes in all of Chile, the effects in Santiago and finally the ecological effects.

The preparation by EMOS before the privatization in Santiago allowed the citizens to adapt to the higher prices for water since they increased slowly over time. The Water Code of 1981 created a system in which public company, EMOS could operate as a private company with WUR in a water market. The biggest investor in EMOS was CORFO, a public company invested in the economic development of Chile, that allowed for EMOS to implement a price system that would subsidize the poor users in the city. All of these factors came together to create a water system in which more consumers were able to get affordable potable water.

The lack of preparation in Bolivia for the water privatization in the late 1990s created an environment in which the citizens in Cochabamba and La Paz could not afford the swift price hikes and led them to revolt against the private water company. Additionally, the companies that were in charge of the water systems in these countries were given rights for 30 years and guaranteed profit for that time period, so even though they were brought into the country to help bring water to the citizens that did not previously have it, the companies focused instead on predicted profitable areas through which they could generate revenue.

Finally, I looked into the ecological situations of the water resources in each city today and have found that both cities are experiencing water scarcity from climate change and retreating glaciers as well as a lack of infrastructure to protect water resources from contamination. Heavy rains and landslides threaten the settlements on the slopes of the mountains that surround both cities and mining companies threaten the water resources with over-usage and pollutants. Water policy will need to focus on protecting water resources in the coming years as they become more endangered.

It is for these situations that I recommend a new water policy be put into place based on institutional pluralism and following the Chilean model. Under water policy, the water company can work like a private entity but the investors are local so that the company keeps a social perspective throughout their business. I also propose investment into water infrastructure to protect rivers from heavy runoff during storms, as well as technology such as water meters and desalinization plants to help minimize the wasteful use of potable water resources. I think that institutional pluralism, which allows the government to set up a market in which public sector goods can be sold with a social conscience and participate in the market as a private entity would be a good framework off of which to base water policy for developing nations. The hybridization of the Chilean water company EMOS is a good example of company with public interests being allowed to function as a private company. Perhaps not privatizing the company and implementing policies within the water sector that limits the amount of water it is allowed to sell would help limit water usage and therefore protect the sustainability of water resources. Transparency and checks and balances are incredibly important so that wealth and public good are spread equally throughout society. Finally I suggest that individual roles within the water system, such as a water superintendent and water regulator, be different individuals.

BIBLIOGRAPHY

- Acemoglu, Daron, and James A. Robinson. 2012. *Why nations fail: The origins of power, prosperity and poverty*. 1st ed. New York: Crown Publishers.
- Aitken, Douglas, Diego Rivera, Alex Godoy-Faúndez, and Eduardo Holzapfel. 2016. Water scarcity and the impact of the mining and agricultural sectors in Chile. *Sustainability (Switzerland)* 8 (2): 128.
- Archundia, D., C. Duwig, L. Spadini, G. Uzu, S. Guédron, M. C. Morel, R. Cortez, O. Ramos Ramos, J. Chincheros, and J. M. F. Martins. 2017. How uncontrolled urban expansion increases the contamination of the Titicaca lake basin (El Alto, La Paz, Bolivia). *Water, Air, & Soil Pollution* 228 (1): 1-17.
- Baer, Madeline. 2014. "Private Water, Public Good: Water Privatization and State Capacity in Chile." *Springer Science+Business Media* 49: 141-167. Accessed April 13, 2017: doi:10.1007/s12116-014-9154-2
- Bauer, Carl J. 1998. *Against the current: Privatization, water markets, and the state in Chile*. Boston: Kluwer Academic Publishers.
- Bland, Daniel. 2013. "Las tarifas más y menos costosas de las empresas de aguas de Latinoamérica." August 19. Accessed March 3, 2017. <https://subscriber.bnamericas.com/Subscriber/es/features/aguasyresiduos/las-tarifas-mas-y-menos-costosas-de-las-empresas-de-aguas-de-latinoamerica>
- Brichieri-Colombi, Stephen. 2009. *The World Water Crisis: The Failures of Resource Management*. New York: I. B. Tauris.

- Carson, Melissa. 2011. "Water Scarcity." *Food: In Context* 2:839-841. Accessed October 4, 2016
- Cech, Thomas V. 2005. *Principles of water resources: history, development, management, and policy*. Hoboken: John Wiley & Sons.
- Cohen, John M., Stephen B. Peterson, and United Nations. 1999. *Administrative decentralization: Strategies for developing countries*. West Hartford, Conn: Kumarian Press.
- CORFO. 2015. "About Corfo." Last modified 2015. <http://www.english.corfo.cl>
- Craze, Matt. 2015. "Chile's Water Shortage Threatens Wines and Mines." March 9. Accessed March 3, 2017. <https://www.bloomberg.com/news/articles/2015-03-10/wines-to-mines-imperiled-as-chile-fights-california-like-drought>
- De la Fuente, Manuel. 2003. "A Personal View: The Water War in Cochabamba, Bolivia: Privatization Triggers an Uprising." *Mountain Research and Development* 23: 98-100. Accessed September 25, 2016. doi: [http://dx.doi.org/10.1659/0276-474\(2003\)023\[0098:APVJ2.0.CO;2](http://dx.doi.org/10.1659/0276-474(2003)023[0098:APVJ2.0.CO;2)
- Donoso, Guillermo. 2006. "Water markets: case study of Chile's 1981 Water Code." *Ciencia e Investigacion Agraria* 33(2): 157-171.
- Donoso, Guillermo. 2013. "Evolution of water markets in Chile." In *Water Trading and Global Water Scarcity*
- Easterly, William, Luis Servén, and World Bank. 2003. *The limits of stabilization: Infrastructure, public deficits and growth in latin america*. Washington, DC: World Bank.

- Escurra, Jorge José, Víctor Vazquez, Rita Cestti, Erwin De Nys, and Raghavan Srinivasan. 2014. Climate change impact on countrywide water balance in bolivia. *Regional Environmental Change* 14 (2): 727-42.
- FSRN. 2016. “Massive water shutoff in Chilean capital highlights long struggle over resource management.” *Free Speech Radio News*. April 22. Accessed March 3, 2017. <https://fsrn.org/2016/04/massive-water-shutoff-in-chilean-capital-highlights-long-struggle-over-resource-management/>
- Gallagher, David. “The heavy price of Santiago’s privatized water.” *The Guardian*, September 2016. <https://www.theguardian.com/sustainable-business/2016/sep/15/chile-santiago-water-supply-drought-climate-change-privatisation-neoliberalism-human-right>
- Gracia, Javiera. 2017. “Aguas Andinas in hot water in Santiago.” *BNAmericas*. February 28. Accessed March 3, 2017. <https://subscriber.bnamericas.com/en/news/aguas-andinas-in-hot-water-over-santiago-cuts>
- Harvey, David. 2007. *A brief history of neoliberalism*. Oxford;New York;: Oxford University Press.
- Hoekstra, A. Y., and Mekonnen, M. M. 2012. “The water footprint of humanity.” *Proceedings of the National Academy of Sciences of the United States of America* 109(9): 3232–3237. Accessed October 16, 2016. <http://doi.org/10.1073/pnas.1109936109>
- Hoekstra, AY, and MM Mekonnen, AK Chapman, RE Matthews, BD Ritcher. 2012. “Global Monthly Water Scarcity: Blue Water Footprints versus Blue Water Availability.” *PLoS ONE* 7: 1-9. Accessed September 29, 2016. doi: 10.1371

- ICWE (International Conference on Water and the Environment). 1992. *The Dublin statement and report of the conference*. Geneva: World Meteorological Organization.
- Lagorio, Juan J. 2014a. "Drought-stricken Chile looks to reform water industry." May 22, 2014. Accessed March 3, 2017. <https://subscriber.bnamericas.com/Subscriber/news/waterandwaste/drought-stricken-chile-looks-to-reform-water-industry1?lang=en?lang=en>
- Lagorio, Juan J. 2014b. "Chile Senators call for water nationalization." April 24, 2014. Accessed March 3, 2017. <https://subscriber.bnamericas.com/Subscriber/en/news/chile-senators-call-for-water-nationalization1>
- Lagorio, Juan J. 2014c. "How critical is Chile's water crisis?" July 24. Accessed March 3, 2017. <https://www.bnamericas.com/en/news/waterandwaste/how-critical-is-the-water-crisis-in-chile>
- Laurie, Nina, and Carlos Crespo. 2007. Deconstructing the best case scenario: Lessons from water politics in la Paz–El alto, bolivia. *Geoforum* 38 (5): 841-54
- Liu, Tong, Tsuyoshi Kinouchi, and Fabiola Ledezma. 2013. Characterization of recent glacier decline in the cordillera real by LANDSAT, ALOS, and ASTER data. *Remote Sensing of Environment* 137 : 158-72.
- Maestu, Josefina. 2013. *Water Trading and Global Water Scarcity*. New York: RFF Press.
- Martinez, Ricardo. 2017. "With melting glaciers and mining, Bolivia's water is running dangerously low." January 5. Accessed March 3, 2017. <https://www.pri.org/stories/2017-01-04/la-paz-short-water-bolivia-s-suffers-its-worst-drought-25-years>
- Perry, C. J., Michael Rock and D. Seckler. 1997. "Water as an Economic Good: A Solution, or a Problem?" Research Report 14. Colombo, Sri Lanka: International Irrigation Management Institute.

- Pflieger, Géraldine. 2008. Achieving universal access to drinking water and sanitation networks in Santiago de Chile: An historical analysis 1970-1995. *Journal of Urban Technology* 15 (1): 19-51.
- Poupeau, Franck and Sébastien Hardy. 2016. "The social conditions of self-organized utilities: water cooperatives in La Paz and El Alto, Bolivia." *Water International* 1-19. Accessed October 26, 2016. doi: 10.1080/02508060.2016.1219196
- Rangecroft, S., S. Harrison, and K. Anderson. 2015. "Rock glaciers as water stores in the Bolivian Andes: An assessment of their hydrological importance". *Arctic, Antarctic, and Alpine Research* 47 (1): 89-98.
- Reuters. 2015. "Chile Says Drought Permanent, Lays Out Water Plan." March 24. Accessed March 3, 2017. <http://www.voanews.com/a/reu-chile-says-drought-is-permanent-as-it-lays-out-water-plan/2693072.html>
- Reuters. 2016. "Chile floods: 4 million people without water as world's largest copper mine suspends operations." April 17. Accessed March 3, 2017. <http://www.abc.net.au/news/2016-04-18/chile-floods-four-million-people-without-water/7333756>
- Rivera, Andrés, G. Casassa, C. Acuña, and H. Lange. 2000. "Variaciones recientes de glaciares en Chile". *Investigaciones Geográficas* 34 (1): 29-60.
- Setegn, Shimelis Gebriye, and Maria C. Donoso. 2015. *Sustainability of integrated water resources management: Water governance, climate and ecohydrology*. Cham, Switzerland: Springer.

- Spronk, Susan. 2007. "Roots of resistance to urban water privatization in Bolivia: The new working class, the crisis of neoliberalism, and public services". *International Labor and Working-Class History*(71): 8-28.
- Walker, Keith. 2016. "Bolivia's severe water shortage triggers national emergency." November 11, 2016. Accessed March 3, 2017. <http://www.euronews.com/2016/11/23/bolivia-s-severe-water-shortage-triggers-national-emergency>
- World Bank. 1996. *Implementation Completion Report: Chile - Second Santiago Water Supply and Sewerage Project*. Washington, DC: World Bank.
<http://documents.worldbank.org/curated/en/546701468010508380/Chile-Second-Santiago-Water-Supply-and-Sewerage-Project>
- World Bank. 1998. *Implementation Completion Report: Bolivia – Major Cities Water and Sewerage Rehabilitation Project*. Washington, DC: World Bank.
- World Bank. 2004. *Bolivia: Public Expenditure Management for Fiscal Sustainability and Equitable and Efficient Public Services. Public expenditure review (PER)*;. Washington, DC. © World Bank. <https://openknowledge.worldbank.org/handle/10986/14385> License: CC BY 3.0 Unported.
- World Bank. 2016. "Country at a glance." *World Bank*. Accessed April 16, 2017.
<http://data.worldbank.org/indicator/NY.GDP.MKTP.CD?locations=CL>