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WATER, WOMEN, AND MIGRATION:
EXAMINING THE INTERCONNECTIONS BETWEEN WATER SCARCITY,
ENVIRONMENTAL MIGRATION, AND WOMEN IN BOLIVIA

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By Sarah T. Meeks

A thesis presented in partial fulfillment of the requirements for completion
of the Bachelor of Arts degree in International Studies
Croft Institute for International Studies
Sally McDonnell Barksdale Honors College
The University of Mississippi

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ABSTRACT

Water insecurity has received growing attention as climate change is worsening environmental conditions, and research has established how water insecurity has differentiated impacts according to one's gender. In light of both an increasing trend in environmental migration and extreme weather events in Bolivia, this paper sought to establish environmental migration's explicit role in the relationship between water scarcity and gendered effects. To do so, it addressed the question, "how does environmental migration influence the relationship between gendered effects and water scarcity?" and hypothesized that migration is a more subtle and overlooked contributor to the gendered effects of water scarcity. The research constructed a descriptive case study of Bolivia, highlighting the situation of water scarcity and environmental migration in Bolivia, using sources such as household surveys, videos, and census data. The results created a profile of the situation of these phenomena in Bolivia and confirmed the relationship between water scarcity and gendered effects, as well as the presence of migration in water-scarce regions. After establishing these trends, the paper related the three phenomena, suggesting a direct role of environmental migration in water scarcity's gendered effects. Worsening environmental conditions due to climate change, mismanagement of resources, and inaction to address these issues will exacerbate the situation. Solutions should address ending environmentally harmful practices and improving women's conditions, including incorporation and empowerment of women in decisions surrounding water accessibility. Further research on the topic include the comparative effects on men and women of environmental migration, as well as the study of other vulnerable populations.

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CHAPTER 1: INTRODUCTION & COUNTRY PROFILE

Introduction

Bolivia's diverse geography includes the Andean region in the West, composed of a highland plateau region known as the Altiplano, the lowland plains of the Amazon River Basin in the East, and a hill region that is situated between the two. While the Bolivian lowlands offer an image of Bolivia of lush green rainforests and plentiful water, the other side of the country, home to a large percentage of the population, lives in a different reality. It is nearly impossible to convey to the reader just how arid the environment in the Altiplano region of Bolivia is. Even in major cities like La Paz, which is situated in the mountainside, the terrain is overwhelmingly dry. Dirt prevails over lush forest. In 2016, I spent the month of July in La Paz. Towards the end of the month, my class took a trip to the Altiplano under the guidance of Suyana, a Swiss NGO based in La Paz that works to empower small communities in Bolivia with environmentally sustainable practices, including creative methods for improved water sources. The most striking and beautiful element of the Altiplano is its seemingly endless expanse. The land is entirely flat, except for occasional mountain ranges in the far distance. The land is devoid of vegetation: only small grasses and low-to-the-ground shrubs spot the vastness. While the arid environment is present in cities like La Paz, the empty expanse of the Altiplano offers a more arresting image of this environment, devoid of water.

On the trip to the Altiplano, we visited several small communities often constituted by only a handful of buildings, constructed from mud and other natural

materials. We visited communities that had been aided by Suyana's projects, often basic mechanisms to encourage sustainable practices, such as composting and water collection. These simple projects demonstrated the huge lack that existed in the Altiplano and left me wondering what the villages without interventions by an NGO looked like. One town left a particularly powerful impact.

When we arrived in Jerusalén, a community situated in the municipality of Jesús de Machaca just adjacent to the Peruvian border, we were greeted by the *mallku* (town leader), dressed in traditional clothing: a red poncho, a *chullo* (a specific Andean style hat), and a *chicote* (whip worn as a symbol of authority). After touring the church, that had desks instead of pews because of its double role as a schoolroom, we gathered in a circle with some of the village members. Suyana had not yet implemented any projects in this village, so we spent time listening to the village members and the Suyana representatives discuss the potential of establishing a relationship that would lead to some additional resources for the village. We learned that the village, which didn't have running water or wells, hadn't had access to water in over six months and was not confident that it would return. They described the severity of the situation to us, saying, "The government never comes here. They forget about us because we are on the border." This occurred before the La Paz water crisis in the fall of 2016. This town conveyed to me the reality of living on the margins in Bolivia, often in the Altiplano without resources and attention from the government. These stories are only compounded by glacial melt, the drying of dams and evaporation of lakes, and extreme droughts, all of which have worsened since I visited Bolivia in 2016.

As growing attention is being devoted to issues of environmental degradation, previously overlooked concerns such as water scarcity are receiving increasing awareness. From a physical perspective, there is little available supply of fresh water, which makes up only 3% of the world's water, and two-thirds of that is inaccessible due to being frozen in glaciers ("Water Scarcity," WWF). The physical inaccessibility of water is inevitable, but it is compounded by mounting stress on water systems, as they dry up, become polluted, and are consumed at enormous rates for activities such as agriculture. These trends affect people at all levels around the globe and are projected to worsen. The United Nations Educational, Scientific, and Cultural Organization (UNESCO) estimates that by 2025, two-thirds of the world's population may face water shortages ("Water Scarcity," UN).

Aside from physical shortages of water, people also face water insecurity due to non-physical barriers. The degradation of water resources is compounded by poor infrastructure to access water supply and a failure of institutions to ensure regular supply ("Water Scarcity," UN). These issues are further complicated and exacerbated as growing urban populations place pressure on water sources. In order to adapt to these changes, many living in water stressed areas resort to migration. The Internal Displacement Monitoring Centre (IDMC) estimates that an average of 22.5 million people have been displaced by climate or weather-related events since 2009 ("Climate Change and Disasters", "IOM Outlook"). Meanwhile, the UN Convention to Combat Desertification (UNCDD) estimates that with the existing state of climate change, water scarcity in some arid and semi-arid places will displace between 24 million and 700 million people by 2030 ("Water Scarcity," UN). Environmental migration is not a new phenomenon, but

with a changing climate that is causing an increase in weather-related events (such as extreme rain, changing temperatures, and drought), the incidence of migration due to climate change, and water scarcity more specifically, will only be exacerbated (Laczko and Aghazarm 19).

The potential implications of an increase in environmentally-induced migration could induce conflict and contribute to an even greater ratio of people to available resource, thus worsening the condition and contributing to a cyclic effect (“Climate Change and Disasters”). This phenomenon also has large implications for vulnerable populations, such as rural, indigenous, poor, and female populations. The issue of water scarcity has well-studied consequences for health indicators and inequities across urban/rural populations, but the implications for inequities across gender are also important. It is established in the literature and amongst international organizations such as the United Nations (UN), and the World Health Organization (WHO) that water insecurity is a gendered issue, meaning that it has disproportionate effects on women (in comparison with men), as women often constitute the group responsible for sourcing water and carrying out water-related household chores and are thus disproportionately affected when water sources are physically scarce or inaccessible through mismanagement and failing institutions.

This paper seeks to examine how the phenomenon of environmental migration is related to the pre-established relationship between water scarcity and its gendered effects. To do so, it addresses the question, “how does environmental migration influence the relationship between gendered effects and water scarcity?” The research constructs a descriptive case study of Bolivia, highlighting the situation of water scarcity and

environmental migration in Bolivia. Based on the ideas proposed in the theoretical framework, I hypothesize that migration is a more subtle and indirect contributor to gendered effects of water scarcity but is related to this pre-established relationship. My expectation in performing this research is that due to women's responsibilities in everyday household chores and because men's response to migrate to escape environmental degradation, women experience a differentiated situation when confronting water scarcity, demonstrating a more acute awareness of the realities of water scarcity in the region. I expect migration to be present in light of environmental stresses such as water scarcity and thus predict that migration is more prevalent in water scarce regions such as the Altiplano, but less widespread in the lowlands, where water is bountiful.

The paper begins with a brief country profile, which is followed by the literature review. The paper then lays out the methodology for data analysis. The analysis of the paper follows and integrates quantitative data with primary sources, including videos and surveys. Together, these data address the research question and spark discussion. The paper ends by offering a final discussion, which includes suggestions for further study.

Country Profile

Economically, Bolivia is one of the poorest countries in the world, with much of its population living below the poverty line, and it ranks near or at the bottom of Latin American countries in additional indicators of health and development, education, malnutrition, mortality, life expectancy, etc. (World Bank & "World Factbook"). Because

of its economic situation, Bolivia suffers intensely in situations of drought and water scarcity.

Demographically, Bolivia's highly indigenous profile has been increasingly celebrated by the country and its government. Bolivia is home to 36 recognized peoples, who speak Spanish and a myriad of indigenous languages, all of which are recognized as official languages by the 2009 constitution ("World Factbook" & "Indigenous Peoples"). In 2006, Bolivia elected its first indigenous president, Evo Morales, who remains president today and who has brought about several reforms that celebrate indigenous heritage. In 2007, for example, Bolivia adopted the official name, "the plurinational state of Bolivia," further underscoring the importance of indigenous culture and heritage in Bolivia ("Indigenous Peoples"). Beginning in 2009, alongside its traditional country flag Bolivia raised the "wiphala" a flag that represents the indigenous peoples of Bolivia ("World Factbook"). However, despite increased celebration of culture and attention to human rights, Bolivia's indigenous population constitutes much of the impoverished population of Bolivia.

Because women are central to this paper, it is important to understand the status of women in Bolivia. Historically, Bolivia has had a misogynist culture that reinforces women's role as subordinate, dependent, and charged with reproduction and family care ("Situation of Women"). The government of Bolivia highlights improvements such as increased access to economic opportunities and higher participation in school, the labor force, and government, as indicative of women's positive status. However, men and women in Bolivia do not live in equity, and there remains a large gap in dimensions of well-being between genders. Women lag behind men in many indicators of wellbeing and

empowerment: illiteracy is greater among women, the adolescent fertility rate in Bolivia is higher than the regional average, the maternal mortality rate is severe, and violence against women in Bolivia is ranked one of the highest in Latin America (“Bolivia: Challenges” & “Situation of Women”). Furthermore, despite a technical increase in participation among women in the economy and politics, the reality is that women do not participate in decision-making processes within these institutions, have a low income-generating capacity, and are often left with jobs that are the least productive and worst paid due to discrimination and lower education levels. At the same time, women are primarily responsible for taking care of the children and household chores and maintenance (“Situation of Women”). An additional challenge for gaining gender equality in Bolivia is the phenomenon of “intersectionality,” or the additive disadvantages resulting from the intersection of multiple identities. In Bolivia, women who are also indigenous are particularly vulnerable to discrimination and fall behind in areas such as education, health care, and ancestral land rights. In a country that has a large indigenous identity, this reality is troublesome (“Bolivia: Challenges”). While the government has made some moves toward gender equality (constitutional changes and specific laws to address violence against women, racism or discrimination of any kind, and harassment and political violence, as well as laws requiring gender parity and alternating political representation), Amnesty International cites a need for the government and society to live up to these commitments, pointing to a lack of effective action and financial investments that leaves women and girls suffering from a lack of services and basic rights (“Bolivia Vows New Laws”; “UN Bolivia Women’s Rights”).

CHAPTER 2: LITERATURE REVIEW

Figure 1 offers a visualization of the relationships I analyze in this paper.

Literature has established the direct connection between water scarcity and gendered effects. However, there are also indications that migration contributes to this relationship, though always mentioned in an off-handed, implicit manner. This paper argues the explicit relationship between environmental migration and the gendered effects of water scarcity.

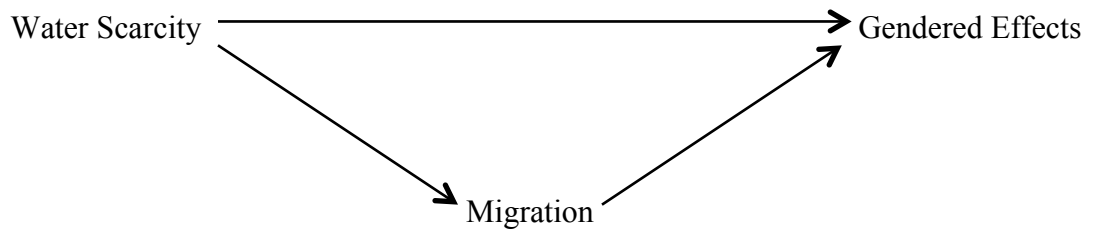


Figure 1: The Relationship between Water Scarcity, Migration, and Women

Establishing Water Scarcity as a Gendered Issue

The Food and Agriculture Organization of the United Nations (FAO) defines water insecurity as “insufficient and uncertain access to adequate water for an active and healthy lifestyle” (FAO 3). However, this definition fails to address the *experience* of water insecurity (Hadley and Wutich 452). In Amartya Sen’s 1981 book *Poverty and Famines: An Essay on Entitlement and Deprivation*, he highlights that food insecurity, while often assumed to be the result of an absolute scarcity of food, actually results from

an inequitable access to food. This theory can be applied to water insecurity: inequities in water management and supply contribute to water insecurity more heavily than a lack of water quantity (Wutich and Brewis 448; Howard and Bartram 24).

Globally, international organizations such as the World Bank, the United Nations (UN), and the World Health Organization (WHO) have recognized water as a gendered issue, manifested primarily in inequities to water access. There are three key elements that lead to an inequity in access to water. First, the process of obtaining water is labor and time intensive, and as a result, women forego opportunities on more productive endeavors, empowerment activities, education, and leisure activities. In addition, some women have no convenient access to water and sanitation facilities. In such cases, women must give up privacy and the safety of the home in order to reach these services, an outing in which they can be subjected to sexual harassment or assault (“Gender and Water”). Finally, there is a lack of female voice in the water management process. Even though women are often the ones primarily responsible for water management and access, they are not proportionately represented in the official administration and management of water (“Gender and Water”).

Narrowing in focus, one can examine the work that has been conducted in Latin America. Amber Wutich’s work in Bolivia has established powerful examples of the gendered issue of water insecurity. According to Wutich, women in Bolivia report more stress than do men over water insecurity, suggesting a disproportionate and more intimate effect on women. According to her findings, the inequities among women in access to water emerge from the social structures that underlie the distribution and management of resources (Wutich and Ragsdale 2118). Wutich’s findings support Sen’s work and

suggest that “suffering from water” develops more as a result of social inequities in water *distribution*, rather than of inadequate water supply. Wutich also contributes inequities to a lack of predictability and organization among groups pertaining to water resource management (Wutich and Ragsdale 2122).

Another key work regarding the gendered effects of water insecurity in Latin America is Vivienne Bennett et al.’s *Opposing Currents: The Politics of Water and Gender in Latin America*. Written in 2005, this book confirms the phenomenon of assigning gender to water systems. For example, “domestic water systems” involve water for home use and are associated with women, while “irrigation water systems” refer to water used in agriculture and are associated with men. Irrigation water systems are more formal and exclude female participation and recognition (Zwarteveen and Bennett 13). Because women are those responsible for household chores that involve water collection, they are more likely to feel and confront the effects of water scarcity. But by denying women’s involvement and perspective in policy and planning of water resources, gender inequity is perpetuated.

The intersection of gender and water scarcity grows in importance in periods of water stress and the concept of insecurity as tied to distribution is amplified in instances of water scarcity. In these cases, women are put at a multiplied disadvantage. Moreover, water collection becomes more labor-intensive, physically demanding, and stressful. Because this process is largely borne by women, it results in a gender-differentiated outcome (Zwarteveen 6, 25).

The Emerging Trend of Environmental Migration

The paper also examines environmental migration, particularly caused by water insecurity, including due to drought and glacial melting. A *New York Times*' feature cited that of the 65 million people displaced from their homes globally, 25 million are refugees and asylum seekers, but that number does not include people displaced by climate change (Casey & Haner). The Internal Displacement Monitoring Centre (IDMC) in 2014 offered evidence that in 2013 alone, natural disasters displace 22 million people. In 2016, that figure rose to 24 million displaced within their country, a figure which exceeded those displaced by conflict and violence in the same year (6.9 million) ("State of Environmental Migration 2014").

Still, these figures do not include people affected by slow-onset environmental factors such as climate change. Future projections indicate that previously unprecedented extreme weather events may become the norm rather than the exception. Such events, in conjunction with other drivers of population, will amplify the risk and challenges of displacement over the 21st century ("Human Mobility").

The media often uses the term "climate refugees" to refer to those moving due to environmental stressors. However, the IOM discourages the use of this term, because of the legal difference between "refugee" and "migrant." The Office of the United Nations High Commissioner for Refugees (UNHCR) legally defines a refugee as a "person fleeing armed conflict or persecution" and the 1951 Refugee Convention appoints refugees certain legal rights. Migrant, by contrast, has no universal definition and is often understood as someone who is not "under direct threat of persecution or death" (Edwards). These distinctions are important because a so-called "climate refugee" does

not actually legally fall under the definition of “refugee” and therefore is not able to gain legal protection or benefit. While I find challenges in the demotion of these “migrants” to a less protected status, as climate effects can be dire and even fatal for those whose livelihood depends on the natural resources, the definition of refugee is objective and specific, and an expansion or restructuring of this legal definition has risks. Therefore, the IOM has proposed a definition of “environmental migrants” as:

Persons or groups of persons who, for compelling reasons of sudden or progressive change in the environment that adversely affects their lives or living conditions, are obliged to leave their habitual homes, or choose to do so, either temporarily or permanently, and who move either within their country or abroad (Laczko and Aghazarm 19).

The IOM report “Migration, Environment and Climate Change: Assessing the Evidence” is one of the foremost reports that highlights important concepts regarding environmental migration. First, environmental pressures as a cause for migration, though newly popular in the media, are not a new trend, but have rather seen an unprecedented scale and recognition (Laczko and Aghazarm 13). Furthermore, climate change on its own does not displace people, but the environmental effects produced by climate change and the exacerbations of present vulnerabilities that these effects cause contribute to the category of push factors (Laczko and Aghazarm 14). Environmental migration includes those who move due to both short- and long-term environmental events and while the media focuses more on immediate events such as natural disasters, the IOM suggests that there are in fact more people displaced by long-term environmental degradation. Those who rely on agriculture are especially vulnerable to slow-onset events that threaten rural

household income and are often forced to diversify their income, leading them to migrate. Migration is often internal, following rural-rural or rural-urban migration trends. Furthermore, factors such as gender, age, and ethnic background influence environmental migration. Together, these factors can affect environmental migration, which can be organized along multiple spectra as: voluntary/forced, temporary/permanent, internal/international, and vulnerable/resilient (Laczko and Aghazarm 23-4). Finally, the IOM focuses on current policy response to environmental migration, which is overwhelmingly negative. Many existing policies view migration negatively and thus have harsh terms for these migrants. The World Bank suggests that policies intended to restrict migration are actually self-defeating and contribute to greater costs both to migrants and to the places that send and receive them (Laczko and Aghazarm 25-6).

The Gendered Effects of Migration

Finally, I address the gendered aspect of migration, depicted in **Figure 1** by the arrow between migration and gender. The International Organization for Migration (IOM) indicates that gender influences the migration process, including reasons for migration, who is migrating, to where, how, at what risk, and what resources are available at destinations (“Gender”). Globally, the share of female and male *international* migrants is fairly close to equal. Though some literature (see Castles and Miller’s *The Age of Migration*) has touted a recent “feminization” of migration at the global level, a paper released by the Migration Policy Institute suggests that this trend is not recent, but that big shifts in gender balance occurred before 1960 and that women and girls have long participated in migration. Since these shifts, the global migrant stock has remained

fairly gender-balanced (Donato). The “migration data portal” (directed by the IOM’s Global Migration Data Analysis Centre) confirms this, suggesting that the share of female migrants has remained relatively stable since 1960. However, they highlight changes in the how and why of migration: more female migrants are migrating *independently* for work, education, and as the head of household. The data portal also underscores the persisting challenges and discrimination that female migrants face in comparison to male migrants (“Gender”).

While women constitute just under half of the global international migrant stock (48.4 %), when broken down by region, this balance varies. 2017 figures indicate that Asia and Africa have a lower share of female migrant than the global level, at 42.4 and 47.1 %, respectively, while Europe and North America have a larger portion of female migrants, at 52 and 51.5 % respectively (accounted for by factors such as the presence of older migrants and the longer life expectancies of female migrants). In Latin America, Oceania, and the Caribbean, the number of female international migrants reached 50.7%, and the stock of female international migrants grew faster than its male counterpart (“Gender”).

Despite these figures, when I asked Women for Water Partnership for information about women’s migration experience they replied, “Women often do not migrate due to climate and environmental changes... it is often men who are leaving” (WfWP). Several sources that focus specifically on Latin America also suggest that men are the primary migrants in this region, often escaping agricultural hardship (see: Kaenzig, “Mi Agua,” WfWP secretariat, Canal 24H, etc.).¹ Men’s out-migration can have differentiated effects

¹ In situations in which women migrate, gender is additionally an important factor throughout the migration process, producing differential outcomes for women. Prior, during, and after migration, factors such as

on women who stay behind but they vary according to whether one is examining the location of origin or destination. Many have sought to determine if out-migration of men leads to an increase in empowerment for women but the literature remains largely inconclusive and country-specific. In some cases, women gain increased social mobility, economic independence, and autonomy with new employment, particularly in the labor market. This may change a woman's role in the family, granting her more power and participation in family decisions (Boyd and Grieco). This increase in decision-making power and access to and control of resources could also enhance women's empowerment by creating opportunities for the renegotiation of gender relations (Chant and Craske as ctd. in McEvoy; Mahler).

While autonomy can increase for women, it does not always. Even in cases in which a woman's independence increases, her position within the family may remain unchanged and men may maintain autonomy of household decisions from a distance (Boyd and Grieco; Chant 1997 as ctd. in McEvoy). Moreover, new employment and an assumption of the husband's traditional role may expand the definition of "mothering" and women's work-burden (Boyd and Grieco; Cortes). In some cases, men's absence will limit women's access to resources or will not be accompanied by financial remittances, both of which lead to negative outcomes for women left behind (McEvoy).

Zwarteveen's example of denying women's involvement in policy and planning confirms the idea set forth by Boyd and Grieco that societal values and structures dictate a woman's experience of migration and may inhibit the positive potential opportunities

gender relations and hierarchies (both at a family and societal level) result in "dependent" status, pushing women towards a family rather than market role and pushing them into domestic service, both of which contribute to complications in gaining residency, rights, and entitlements. These factors can inhibit full inclusion in society (Boyd).

for women. While there are several competing hypotheses, many cases remain rather vague.

CHAPTER 3: CASE SELECTION & METHODOLOGY

Case Selection

Bolivian Water War

Historically, Bolivia is well-known for the attempted privatization of water that resulted in the Water War in Cochabamba from December 1999 to April 2000. The crisis pitted civilians and army against one another, resulting in tactics such as tear gas and in a large number of arrests and injuries, even one boy's death ("Bolivia- Leasing the Rain"). The protests succeeded in forcing Aguas del Tunari (the company that privatized water) to withdrawal and the repeal of legislature allowing privatization in Bolivia ("Bolivia- Leasing the Rain"). One of the relevant consequences of the Water War were the grassroots organizers and "water warriors" who undertook to establish water as a human right, rather than a commodity. This right has been implemented into Bolivia's constitution and Morales himself was a key proponent of the United Nation's move to establish water as a human right globally. The Water War and its impact also serve to demonstrate the power of community collaboration and activism. Despite this activism and action that took place immediately following the Water War, there has been little expansion or investment in improved water sources, reflected by many critics of the government for its corruption and failure to invest in water source improvement ("Bolivia- Leasing the Rain"; CNN; Noticias y actualidad).

Bolivian Water Crisis, 2016

Also key to the selection of Bolivia as a case study is the recent water scarcity crisis. Water scarcity has become a serious reality for many Bolivians, particularly in the case of droughts and climate change. In late 2016, La Paz, the urban capital of Bolivia, suffered a water drought and subsequent crisis that led Morales to declare a state of emergency. The Altiplano region is experiencing a particularly intimate effect of climate change.

Taking the Lake Poopó region of the Bolivian Altiplano for example, an average year has a wet season from November to March and sees about 15 inches of rain and seven dry months. El Niño, the ocean warming of the Pacific, has induced weather events that are drastically altering the climate in places like Bolivia; the seasons are changing, with the rainy season shrinking ever more (Weiss). This induces droughts, which are projected to continue and become even more prevalent with warmer temperatures. In just 2015-16, El Niño left Bolivia with its hottest temperatures and the most dramatic drought in the Bolivian highlands' recorded history (Weiss). These changing weather patterns, occurring all over the Altiplano, eliminate the predictability on which farmers depend. Weather patterns occur out of season, and the signs traditionally used are no longer reliable (Fraser).

Susceptibility of the Altiplano to Climate Change

The Altiplano's terrain is what makes it particularly susceptible to climate change: as the mountain ranges trap heat, the plains' temperature rises. The increasing temperatures on the plateau occur at a rate faster than Bolivia's national average. Between 1995 and 2005, the plateau temperature increased 0.9 degrees Celsius (Casey &

Haner). These increasing temperatures force farmers to shift crops vertically and continue up the mountainside (Weiss). Rising temperatures also contribute to some of the elements that make both the Altiplano and Andean region more broadly sensitive to climate change: lake evaporation and glacier melting.

Climate change warms lakes faster than oceans and air. The Andean region is no exception and its rapidly increasing temperatures make it particularly susceptible to the evaporation of lake waters, demonstrated by the disappearance of Lake Poopó, once Bolivia's second largest lake. Evaporation of lakes, in conjunction with mismanagement of water, leads to water shortages and pollution, harming ecosystems and animals (Weiss). The prognosis for cities and towns around areas dependent on lakes is dire (Weiss).

An additional consequence of increasing temperatures in the Andean region is the melting of tropical glaciers. Mountain glaciers are known for their high sensitivity to climate change, and the Andes' tropical glaciers are melting at alarming rates (Francou). Bernard Francou, the director of research for the French government's Institute of Research and Development and who has been researching tropical glaciers for 15 years, explains that the tropics are the second most affected areas by climate change (behind the poles), particularly due to the effects of El Niño. As frequency and intensity of El Niño cycles rise, glaciers respond immediately (Wehner). The atmosphere's increasing temperature at high elevations cannot melt ice directly but rather changes precipitation trends, which result in the rising of freezing lines on the mountains. Consequently, the long-lasting snow cover that usually forms and protects the glacier surface is not present, and strong radiation for tropics at high elevations melt glaciers at high rates (Francou).

Overall, glacier retreat in the tropical Andes over the past 30 years has occurred at an unprecedented rate since the Little Ice Age of the mid-17th to early-18th century, with an average loss of mass balance more negative than that of the global scale (Rabatel).

The evaporation of lakes and glacier melt in areas like the Andes and the Bolivian Altiplano have serious consequences for the people of Bolivia, not only those directly surrounding these water sources, but throughout the country. Because much of the population in Bolivia live in arid regions, they are highly dependent on these water sources for agriculture, hydropower, and domestic consumption (Rabatel). Furthermore, some of those living in the Andean region are particularly vulnerable due to their indigenous status, often relying heavily on nature's elements for well-being by hunting, fishing, and agriculture (Weiss). One citizen affected by the drying of Bolivia's water sources described it powerfully: "If the snow disappears, the people will disappear, too. If the snow disappears, we will be left without water. The pastures and the animals will disappear. Everything is interconnected. The problem of the melting of the glaciers is that the source of life is drying up" (Weiss).

Accelerating the process of climate change and drought are mismanagement, upstream water diversion for agriculture, and mining (Weiss). The overall depletion of water resources, coupled with a lack of infrastructure and adequate government response generates a grave concern among residents (Brown). In many cases, perceptions may precede scientific evidence and data because people can observe local changes that computer models cannot (Fraser). This fact establishes the importance of personal accounts and case studies in the research of environmental migration and climate change.

General Migration Trends & Environmental Migration in Bolivia

Finally, Bolivia has been one of the first places to experience environmentally-induced migration, particularly due to water scarcity. The phenomena of lake evaporation and glacial melt have contributed to environmental migration in Bolivia, a situation expected to worsen with changes in precipitation patterns, leading to varying annual rainfall shifts, flooding, and drought. In South America's Andean region, climate change is decreasing annual runoff and water availability due to glacier retreat ("Regional Maps"). This reality not only has impacts on general water availability, but also will negatively affect ecosystems, crop yields, and fisheries, contributing to increased food insecurity, as well as job loss. These are the very factors that lead to migration among residents and leave heavy implications for a nation that relies on water for much of its employment (agriculture, fishing, and household work), and men are migrating within the country to diversify their incomes. According to the Global Climate Risk Index, Bolivia is one of the most affected countries by extreme weather events, ranking 39th. As of 2014, since Morales' election in 2006, the country had declared eight national states of emergency due to natural disasters ("State of Environmental Migration 2014"). The 2016 drought brought another.

The trends in environmental migration tend to follow the general migration patterns in Bolivia, with migrants moving from rural to urban centers, but typically remaining within a single region (Andersen). Traditional reasons for rural to urban migration include: increased access to the city (due to building and development of roads and communications), as well as increased services and industries in the city; agricultural challenges due to drought, failed agrarian reform, and mechanization; and the decline of

the mining industry. When they arrive, most migrants in urban areas find employment only in the informal sector (such as family business, home industry, and domestic services). Those who do find work in the formal economy usually only find it within construction industries, which are characterized by low wages (Tam). This is a difficult reality for many migrants coming from rural regions. There is still little opportunity within the cities, and migrants are often limited to jobs in informal industries.

In Bolivia, prior to 1970, migrants came primarily from Cochabamba rural communities, but in the '70s and '80s migrants began to move from the Altiplano, reflecting the Altiplano's troubled state ("Bolivia"). Three censuses dating from 1976, 1991, and 2001 have confirmed Bolivia's rural exodus over the last four decades. In 1976, more than 60 per cent of the population lived in rural areas, but the situation was reversed in 1991; by then, 58 per cent of Bolivians lived in cities. In 2001, less than 40 per cent of the Bolivian population lived in rural areas (Heins). The World Bank's 2016 data indicate that only 31% of the population resides in rural areas and that urban population growth is increasing annually at a rate of 2.1% (World Bank).

The gender balance regarding *international* migration and referenced in the literature review is upheld in Bolivia, where 47.6% of immigrants are women ("Bolivia"). Sources that focus on Bolivia at a national level, and thus examine internal migration, contest this fact, concluding that men are those who are migrating in Bolivia.² Historically and at present, husbands and fathers have migrated to cities, remaining semi-permanent city residents but maintaining ties with their homes, while women remained in the village with their children ("Bolivia").

² Some such sources include, for example: Derks, Canal 24H, Kaenzig, and "Mi Agua- La Paz, Bolivia."

For these reasons, Bolivia represents an important country for study regarding the issue of water scarcity and access. The research presents a single case study of Bolivia in order to examine the contributing factors of water scarcity and environmental migration in Bolivia and their effects on women.

Methodology

This paper uses a mixed methods approach. While numeric data provides an explanation of “what” is happening surrounding this issue, the supplementation of qualitative data allows one to dive beyond the numbers, providing insight into the “how” and “why” that explain these phenomena. In a data-scarce environment, a mixed methods approach also serves to create a balanced analysis that uses qualitative data to make up for a lack of readily-available numerical data. Qualitative sources supplemented descriptive statistics and included household surveys as well as newscasts and feature videos that not only provided visual demonstration of the water crisis in Bolivia but also provided first-hand accounts that otherwise would have been difficult to obtain. The paper uses quantitative elements particularly for descriptive purposes. Descriptive statistics were gathered from Instituto Nacional de Estadística (INE) to create a profile of migration trends in Bolivia. I gathered data in excel from the INE database and examined people’s responses to “where did you live five years ago” and organized data by municipality to examine trends in migration in specific areas. I also gathered descriptive statistics from INE’s household surveys, which provided information about trends within Bolivia at the household level. These statistics contributed to a roadmap for

understanding the importance of water scarcity, environmental migration, and whom these phenomena affect most.

The intention for measuring gendered consequences was to analyze women's empowerment. With no indicators to perfectly measure these variables and a lack of data availability for Bolivia, choosing indicators and data sources was extremely important and often relied on proxy measures. Because "empowerment" constitutes a multidimensional concept, I chose a few different indicators. Ideally, an indicator that measured women's empowerment would encapsulate information about women's participation in household chores or hours spent at home. Because this data is unavailable, I examined household surveys that address similar issues (education, employment, household chores) as well as second-hand interviews from women to achieve the best approximation of a measurement of empowerment.

Limitations

There are several inevitable limitations of this research. Because of the subject's relative novelty, and because data collection is often challenging in low-income countries, data availability proved sparse. Though data scarcity in Bolivia exists in part because the country is poor and thus research is under-funded, the geography of the Andean region as a Tropical area further impedes data collection and availability (Viviroli). Topographically, the Andean mountain region presents challenges in data collection: limited meteorological driving data and hydrologic data are available for high elevation areas and data collection from such elevation is difficult (Viviroli). For example, while technologies generally are advancing, the harsh climate of the Andean

region increases the need to maintain sensors (De Bièvre). Furthermore, many of these technologies, when used at higher elevations, present low resolutions that are not highly informative (Buytaert). These new methods are also expensive and often not a priority for such a poor country. The intersectionality of the area as poor and topographically difficult makes it a severely under-studied area and though some research exists, it is narrow in focus and only goes back a short period of time, often less than a decade.

An additional complication in data was the need for internal migration information. While some limited statistics exist on migration in Bolivia, they often examine *international* migration, which does not represent the population this paper sought to study. Moreover, the national statistics do not reflect the driver of migration (here, water scarcity) and therefore fail to demonstrate the nuance that this paper sought to examine.

Distance from the country studied was an additional limitation, making interview and ethnographic data difficult to obtain. This challenge was combatted through the use of videos and newscasts to provide interviews otherwise inaccessible. My lack of fluency in Spanish presented another hurdle, but one that was easily overcome with self-study and translation exercises. Further suggestions for improvement in this study are provided in the discussion at the end of the paper.

Despite this data scarcity, through the use of qualitative data, survey data, and operationalization of variables, my analysis was able to provide the closest approximation possible. The intentionality that was used to represent all sides of the question helped ensure the reliability of conclusions drawn from limited data. My justification for the use

of these variables allows an effective proxy method, but I recognize the use of approximate values means that a perfect data analysis cannot exist.

CHAPTER 4: DATA PRESENTATION & ANALYSIS

The phenomena central to this paper are gender, water, and migration. In order to examine the relationship between these issues, this paper first describes and establishes their presence in Bolivia, then explores their intersections with each other. The presentation of data, therefore, establishes the demonstration of, or variance from, global trends, at a more specific level in Bolivia. After the trends in Bolivia are established, the analysis of the paper seeks to demonstrate the implications of these relationships.

Video Sources to Establish the Situation in Bolivia

My interest in this topic was first piqued by a video published by Project Earth, an online blog writing about environmental issues and working under Gizmodo Media Group. The video was created with support from Participant Media, a film production company dedicated to social change, and highlights the trend of environmental migration in Bolivia. The video focuses on Bolivia as an agrarian society, particularly in rural areas. Footage captures the aridness of the Bolivian highlands, which concentrate some of the areas of highest poverty. Through interviews, the viewer learns the complication from the eyes of the residents. One resident notes a noticeable change in climate: mounting temperatures, concurrent with glacier melt, vegetation disappearance, and longer dry spells. These realities make farming difficult in a largely agrarian society. Moreover, they drive young people to cities, where jobs are still unavailable or low-skilled (“Drought in the Highlands”). While the video provides an image of the aridness in the highlands and

highlights many of the important issues of climate change (such as migration), the video features exclusively men (both in terms of those it interviews and the “experts”), thus demonstrating one of the fundamental issues regarding water scarcity and environmental migration in Bolivia: women, though the ones responsible for much of water collection and use, lack a voice in the conversation surrounding its loss. As evidenced by the droughts in Bolivia in 2016, even urban areas such as La Paz have experienced extreme water drought and scarcity, thus inhibiting the effectiveness of urban migration as a permanent solution. In conjunction, these conditions are leaving huge impacts on the Bolivian population and contribute to climate-induced migration.

After viewing this video, I watched a few videos from the perspective of news organizations, the sum of which provided a good overview of the situation in Bolivia. While some of my other analysis focuses on less urban areas of Bolivia, these videos, broadcast in Spanish from various news networks, focused largely on the water crisis in La Paz and El Alto in 2016. Several videos cited the role of climate change in the drought, in particular the melting of mountain glaciers (Noticias y actualidad). One video provided jarring figures: glaciers have reduced by half in the last 40 years, and the glacier Tuni Condoririr which provides 80% of water to El Alto is predicted to disappear by 2030 (in just twelve years) (Canal 24H). The footage from nearly every video corroborates these claims, showing empty dams and arid mountaintops where glaciers used to sit. The clip also mentions other environmentally-related contributors, such as the destruction of Amazonian jungle (deforestation is an enormous environmental malpractice in Bolivia), which aggravates the existing climate situation by interfering with sensitive nature cycles (Canal 24H). These newscasts, however, also pointed to

factors beyond the environmental world. A bolder video called out EPSAS (the public water company in Bolivia) for mismanagement, a fact that was reiterated by other news sources that reported company executives who had been ousted (CNN; Noticias y actualidad). Finally, one clip made allegations against mining companies, which are alleged to intercept and overuse water from public sources. Morales, however, rejects these allegations, claiming that opponents were “politicizing the issue” (my translation) (CNN).

The videos also demonstrate how this drought affects the population. Footage shows people fetching water with buckets, even trashcans, demonstrating the severe consequences of this drought on common households (CNN). Moreover, droughts have significant impact on the livelihoods of farmers and fishermen who suffer from crop and livestock losses and are forced to migrate (Canal 24H). The 2016 water crisis caused the enforcement of water restrictions in 172 municipalities, and figures suggest only 18% of affected population in La Paz having tanks. Those without tanks are required to go to “sistemas” and recycle water every day (Canal 24H; Noticias y actualidad). For these families, the time it takes to collect water each day is inhibiting. If this level of scarcity and inefficiency is happening at such an urban local, the implication for the reality in more rural areas is grim.

Here again, rhetoric from post-Water-War days resurfaces, as Morales makes a public statement reiterating the nature of water as a “human right” (CNN). Further images of the Water War cannot be ignored, as the vice-minister of drinking water was held hostage in El Alto (Canal 24H). Morales’ proposed solutions focus on infrastructure and large investment, including creating dams with greater capacity (CNN). However,

these solutions are not permanent and fail to address or encourage environmental consciousness and research. The solutions only serve to stave off the issue, for it is not that the current dams lack capacity. They lack water.

In addition to providing some surface level information regarding the water situation in Bolivia, in particular La Paz, the visual elements of the video provide important insight. Not only did these videos highlight the importance and severity of the water situation in Bolivia, but they also provided second-hand interviews of local inhabitants, those I would not have been able to reach otherwise. These news clips provided important public opinion regarding the causes and effects of the water crisis. Moreover, most demonstrate a heavy emphasis on women. Many of the interviews are conducted with women, and footage highlights women. In addition, the footage, particularly a scene in Canal 24H's broadcast which shows a woman collecting water, shows that conserving water takes an inordinate amount of time (Canal 24H). While one often considers the time that people spend *retrieving* the water, the time it takes to *conserve* the water is often neglected. CNN reiterates this, saying that the majority of the population in La Paz only has access to water three hours of the day, and many are forced to search in springs or wait for water delivery trucks. The video repeatedly uses the word *preocupación* (worry) to express the emotions circulating around the area, a term whose significance was explained by Wutich (CNN).

Gendered Effects of Water Scarcity

The first component of this paper, represented in **Figure 1** as the arrow between water scarcity and gendered effects, is the relationship between water scarcity and

women. The impacts of water scarcity on gender are multifaceted, but this paper aims to address a specific dimension, using women's empowerment to examine the relationship between water scarcity, migration, and women. In order to do so, the paper combines both quantitative and qualitative evidence. This section examines data compiled from household surveys in Bolivia.

Amber Wutich's aforementioned works provide a strong foundation for this discussion. Some of Wutich's work presents more basic understandings of the inequities women face in water situations. These inequities are manifested in inaccess, which emerges out of social structures that underlie resource distribution, and the lack of predictability and structure/organization in water resource management (Wutich and Ragsdale 2118). Wutich's research additionally allows access to household and individual female response that this paper otherwise would not have been able to access. Wutich's 2009 work, "Intrahousehold Disparities in Women and Men's Experiences of Water Insecurity and Emotional Distress in Urban Bolivia," involves household surveys administered to heads of household, including those who co-head a household. The results indicate many reasons women are disproportionately affected by water scarcity. The study points to women's time "wasting" water as a way in which water scarcity interferes in the daily schedule of women, unlike men. Moreover, women, who have flexible jobs, rather than men's typically fixed employment, reported a higher loss in income. Moreover, while both men and women economize in times of water scarcity, men appeared only aware of economizing in terms of their own personal hygiene, whereas women reported the economizing for laundry, cooking, etc. Wutich's data also examined emotional implications of water scarcity for men and women, finding that

women in Bolivia report more stress over water insecurity and thus concluding that water scarcity has a disproportionate and more intimate effect on women (Wutich). One of the words Wutich highlights in her surveys is *preocupación* (worry). News coverage supports Wutich's finding. CNN coverage, in particular, reiterates this by repeatedly using the word *preocupación* to describe the population in La Paz which only has access to water three hours of the day, many of which are forced to search in springs or wait for water delivery trucks. One woman demonstrates exactly the dilemma that Wutich explores, describing herself to be "*preocupado ... non por mi, por los niños,*" referencing the idea that Wutich examines which involves women elevating the concerns of her family above herself, thus contributing to additional emotional stressors (CNN). This is a feeling that affects deeply, especially for those primarily responsible for chores requiring water and taking care of the children because they face this situation more intimately. The word "worry" downplays the severity of this emotion in times of extreme water scarcity. This worry is about having enough water to survive and live by, both in terms of income and general wellbeing (water for food, drink, etc.). Therefore, the emotions felt by those intimately associated with water tasks (in this case, women) are severe and contribute to an inequity in experience of water scarcity.

A video entitled "Mi Agua," sponsored by the Development Bank of Latin America and released in 2015, highlights a project that aims to create increased access to safe water for families in their homes. This video featured almost entirely women (save those who were consulted as experts) and demonstrated the vital nature of water to women in periurban and urban Bolivia. The video has positive music in the background, features talented cinematography, and is clearly intended to demonstrate the benefits of

providing water sources in the homes. While these efforts and subsequent improvements for recipient families are impressive and important, viewing the video intentionally can lead to the understanding of the implications for those that are *not* receiving access to on-site water sources.

One woman featured in the video, says that, before, she took several trips to fetch water, which she cites as coming from a dam (which, since this video has been filmed, has likely severely depleted). José Luis, the project supervisor of the not-profit organization Fondo de Inversión Productiva y Social (FPS), reports that water comes from the glaciers, largely from Huayna Potosí. However, as we know, these glaciers are also disappearing at rapid rates. The video highlights two other women, and the emphasis on women's reliance on these water sources demonstrates that women are the primary ones dealing with water in the home. Women are shown living together, both mother and daughters, and are cooking, washing, etc. Another important detail is that the woman featured introduces herself as living with her sister in this house, leaving the viewer to understand that no men are living in the house. The important takeaway from this video is the centrality of water to women in the home. Women are shown in the video cooking and doing laundry, a source of income for some women. These processes, however, require the women to carry heavy loads of water, which end up getting dirtied while washing. Moreover, the sources of water, which another woman says she previously obtained from the river, were dirty and only accessible in the wet seasons. Because the process of obtaining water is so difficult, the women reported sometimes going as long as three weeks without bathing. The women confess to thinking about water all day and wanting to clean the house and water plants but not having the water to do so ("Mi

Agua”).

I supplemented this analysis with additional country-specific data for Bolivia. Because national statistics regarding data on helpful indicators, such as women’s time spent collecting water, do not exist, I analyzed a few household surveys provided by INE. These included the 2016 “Encuesta de Demografía y Salud,” which subdivided surveys into “boleta hogar” (household receipt), “boleta hombre” (man receipt), and “boleta mujer” (woman receipt). The latter two surveys were thus administered separately to men and women. There was value in analyzing these survey’s questions, content, and data.

In analyzing the basic content of the two Household Demographic and Health surveys, a few surface level differences were noted. The survey administered to women was significantly more comprehensive than the one administered to men (50 pages versus 26 pages, respectively). The women’s survey devoted much of the content to reproductive health questions, demonstrating an infatuation with the idea of women as child bearers, and playing into Stacy Alaimo’s association of nature and women.³ The systemic discrimination against women that is built into Bolivia’s culture and society is perpetuated through the reinforcement of the idea of women as child-bearers. These surveys are a testament to the continuing challenges present in overcoming discrepancies in expectations for men and women and how their experiences of events such as water scarcity are distinct. While many of the questions outside of the section on “reproduction” were the same, there was a series of questions administered exclusively to

³ In her work *Undomesticated Ground: Recasting Nature as Feminist Space*, Stacy Alaimo calls to attention the historical association and equation drawn between nature and women. This association with nature robs women of their humanity and contributes to an “othering” of women from culture (2). This division thus leads to the suppression of women and nature by men and culture.

women. These questions addressed women's access to the money they earn, mainly in regards to who decides how to spend the income and how it compares to their spouses. The survey's questions at surface level imply differences in projected gender roles and dynamics, but a deeper analysis of the results reveals even more. I chose to look at this set of surveys because its gender differentiation allowed me to compare results by gender. Overall, while the results were not blatantly indicative of gender discrimination and time spent doing particular activities, they did indicate a potential differentiated experience of water scarcity.

For example, while level of education was generally similar when comparing male and female responses, the reasons *why* the respondent did not participate in school had higher variation. **Table 1** lists the responses. Men reported work and money as their principal reasons for not participating in school, with 59.8% of respondents and 13.6% respondents citing these reasons, respectively. Women, while also citing work and money, did so at differing frequencies. Only 14.3% of female respondents listed work as their reason for not participating, while 20.3% (more than men counterparts) cited money. Women also cited being pregnant (20.8%, and the most popular reason) as a reason for not participating, and 10.8 % listed being married as their reason (while this response was also offered for men, only 4.7% listed it as the reason for foregoing education). Finally, 8.8% of women also cited having to look after kids as one of their reasons for not attending school, while only 0.6 % of male respondents cited this. While the difference in education levels for men and women are not paramount, the men and women's respective reasoning for not participating in education indicate a reinforcement of gender roles.

Table 1: Education: Reasons for not participating

	Female Respondents	Male Respondents
Work	14.3%	59.8%
Money	20.3%	13.6%
Pregnant	20.8%	N/A
Married	10.8%	4.7%
Looking after Kids	8.8%	0.6%

These gender roles are reflected in another question, which asks respondents to confirm who looks after children most of the time. This series of questions offered a yes or no option in response to a list of different people looking after the kids. Results are listed in **Table 2**. Respondents in both surveys most highly reported the mother (82.2% of male respondents said yes to mother; 85% of women said yes to mother). Women were also more likely to report that grandmother or older brother was watching kids, while men did not cite these as examples, suggesting that women are more aware of the household activities. When asked if respondents were students, heads of household, retired, sick, or elderly (in an attempt to gauge why respondents were not participating in workforce) most women (56.6%) reported being “ama de casa,” indicating that they are responsible for the household, while an additional 40.8% indicated that they were students. The men responded with 82.3% identifying as students, and only 4.1 % reporting as “jefe,” or responsible for household.

Table 2: Employment: Reasons for not participating

	Female Respondents	Male Respondents
Head of Household (“ama de casa” for women, “jefe” for men)	56.6%	4.1%
Student	40.8%	82.3%

In analyzing these survey responses, one could also create a profile of employment and financials for men and women in Bolivia. Employment-wise, men and women in Bolivia reported performing similar types of work, largely surrounding agriculture, vendors, etc., though women were more likely to report being cooks and teachers, while men were more likely to report jobs surrounding machinery and auto work. Both men and women largely reported working on own “tierra,” and both had similar responses for employers: ~51% of both men and women reported being self-employed, while ~41% of both men and women reported being employed for another person. Interestingly, 80% of women reported working outside the home (despite having responded more likely to work on own property), a question that wasn’t even posed to men. These results are depicted in **Table 3**. Moreover, both previous questions in this survey and data from other sources indicate that women report being “ama de casa,” or those that look after the household. However, they are now reportedly working “outside the house.” These seemingly contradictory responses emphasize the burdens of responsibility that women bear in their everyday routine and the vulnerability women face in response to stressors such as water scarcity.

Table 3: Employment Characteristics

	Female Respondents	Male Respondents
Work outside the home	80%	N/A
Self-employed	~ 51%	~ 51%
Employed for another person	~ 41%	~ 41%

Financially speaking, 52.1% women reported earning less than their spouse. Moreover, women were asked who decides how to spend both the money that they themselves earn, as well as the money that their spouse earns. The responses are recorded

in **Table 4**. First, this question was not posed to men, a fact which reinforces gender roles. In both cases (regarding woman’s earnings and spouse’s earnings), the majority of respondents said that the spouses decide together. Regarding their own money, 38.1% of women reported deciding on their own, while 59% responded that decisions occur together with spouse. Regarding the spouse’s money, however, 14.3% reported the spouse deciding on his own, while 71% reported that the decisions occur together. Interestingly, deciding together is cited more often than one spouse alone in both cases. However, the difference in these figures is starker in the case of women’s money: the women are more likely to decide about their own money (38.1%) than the men are about theirs (14.3%). While this may initially be surprising, it makes sense when one considers that women are those performing shopping, a fact that is confirmed in yet another question more specifically: women decide alone (more than together with spouse – 52.7% v. 41.4% respectively) about the daily purchases for the home. Together, these results once again confirm that women are busy tending to children, overseeing the home, and conducting errands surrounding health, household, etc.

Table 4: Financial Earnings and Decisions (Asked to Women, Not Men)

	Female Respondents
I Earn Less than My Spouse	52.1%
Who Decides How to Spend Money <i>I</i> make?	I Decide on own: 14.3% Spouse decides on own: Together: 71%
Who Decides How to Spend Money <i>My Spouse</i> Makes?	Spouse decides on own: I Decide: 38.1% Together: 59%

To generate a general overview of the state of water in Bolivian homes, responses specifically addressing water were gathered from the 2016 “hogar” survey targeting the

household and are recorded in **Table 5**. Households were split in reporting having access to a network of pipes within their home (30.6%) versus a network of pipes not *within* the home but within their lot or land (31.9%). These numbers still only account for 62.5% of respondents and do not provide information as to whether the families have access to sanitation and/or plumbing. From their respective water sources, 71.9% of respondents reported having available water all the time, 15.3% reported having availability a few hours daily, and 9.9 % reported availability on some days of the week. These numbers are still fairly low and considering that they represent data achieved from a national survey, they could over represent the reality for people living in more rural areas with fewer resources and services. These numbers do not reflect a specific type of water source and could still mask details important to the situation such as how far the source is from the home, etc. Moreover, when asked how much time they spent going for, collecting, and returning water, responses ranged from 0 (on site) to 150 minutes. However, these responses accounted for less than 50% of those interviewed. Without a large enough response, it is difficult to grasp the general trend. However, the fact that the question is posed indicates the subject is an issue, which is reflected in several other data sources from this paper.

Table 5: State of Water in Homes (Not Gender Differentiated)*

Water Resources	Percent of Respondents reporting Affirmative
Access to a network of pipes <i>within</i> the home	30.6 %
Access to a network of pipes <i>not within</i> the home, but within the land	31.9 %
Water from my water source is available <i>all the time</i>	71.9%
Water from my water source is available <i>a few hours daily</i>	15.3%

Table 5 (continued)

Water from my water source is available <i>some days of the week</i>	9.9%
Time Spent Collecting Water	0 – 150 minutes

*Results only account for 62.5% of respondents, or as low as 50% of respondents in some cases, like time spent collecting water

Moreover, houses often reported no access to modes of transportation: 72.8% reported no bike, 79% reported no motorcycle, and 77.9% reported no automobile. These results are recorded in **Table 6**. Therefore, all chores, including fetching water, require that the individual walk, which will only add additional time and strain on the individual who has to bear the heavy weight of such water tasks, often requiring multiple trips. While many focus on the important aspect of water *collection*, it is also important to understand the challenges of water conservation and use within the home. Data regarding household utilities are recorded in **Table 7**. Once the water does arrive at the home, there are few utilities and technologies *within* the home that would enhance efficiency: 52.7% of respondents reported having no fridge; 85.1% of respondents reported having no washing machine; 89.4% reported having no microwave. This data demonstrates that beyond collecting the water (which in and of itself can be difficult and burdensome, particularly for women), the activities within the home that require water are inefficient due to a lack of technology and utilities, leaving those responsible for household chores (mostly women) with very limited time to do other things, including work, education, leisure, and self-care.

Table 6: Transportation Access

Mode of Transportation	Percent of Respondents Reporting Affirmative
No Bicycle	72.8%
No Motorcycle	79%
No Automobile	77.9%

Table 7: Technology within the Home (2016)

Appliance	Percent of Respondents Reporting Affirmative
No Refrigerator	52.7%
No Washing Machine	85.1%
No Microwave	89.4%

Overall, these surveys provided insightful data for descriptive purposes, permitting a broad description of gender role and household situations within Bolivia. However, the data is also inherently lacking. For many of these figures, there was not always a high response rate, particularly in feedback regarding access to water sources. In other words, people were not responding when given a survey or were being left out of the survey population altogether. This has important implications for such research, particularly for vulnerable groups, because a lack of data often indicates a lack of data representative of the very groups that the research aims to study. Therefore, many of these representations are probably masking some of the direst situations in rural Bolivia, those with the fewest resources, the same population that this research intends to target and help.

Environmental Migration

Represented in **Figure 1** by the arrow between water scarcity and migration, the next key component to this paper is environmental migration.

In order to examine the migration trends in Bolivia at a nuanced level, I acquired 2001 and 2012 census data from INE, and organized data by department and municipality. From these, I was able to examine certain areas that are water-rich (such as those in the Bolivian lowlands) or water-poor (areas like Oruro where Lake Poopó dried up). While recent Bolivian news has focused on urban areas, particularly La Paz, this paper instead focuses on the more rural areas. Migration is a gradual process: those who are beginning to migrate from rural areas, which are heavily affected by changes in agriculture resulting from water scarcity, will migrate first to less rural areas, rather than immediately moving to urban centers such as La Paz or Santa Cruz. Therefore, this paper analyzed migration data from three departments: Cochabamba, Beni, and Oruro. In both censuses, respondents were asked “donde vivía hace 5 años” (where did you live 5 years ago?) and were given four options: “aquí” (here), “en otro lugar del país” (in another part of the country), “en el exterior” (outside of the country), or “aún no había nacido” (I hadn’t been born). In order to determine trends in migration, I took the sum of the values of the latter three responses, all of which indicate migration habits, for each municipality in the three departments. From the total number of respondents, I subtracted the number that reflected migration trends. The results showed an increase migration in nearly every case. Moreover, the differences in increase corresponded to what one would expect the results to be if water scarcity had an impact in migration. In order to compare the census data from 2001 and 2012, I took the change in percent migration of each municipality (according to our definition). From there, I calculated the average change in each department based on municipality data. The results, shown in **Table 8**, indicate what one would expect if migration had influence in water availability.

The water rich region of Beni had a somewhat low average increase of 4.50 percentage points between the two surveys. Furthermore, Beni exhibited many cases of negative changes in percentage, with 5 out of 19 municipalities indicating negative changes (in comparison with 0 out of 35 cases in Oruro, and 4 out of 47 cases in Cochabamba). In other words, more people are continuing to live in one and the same place, rather than migrate. Cochabamba, which falls between Beni and Oruro geographically, had a slightly higher average increase of 6.22 percentage points. Finally, Oruro, a department situated in the highlands, had the highest average increase, at 8.87 percentage points. Moreover, Oruro also had numerous large-increase outliers. Ten out of 35 municipalities saw increases of 10 percentage points or greater. This indicates the prevalence of migration in these rural, water scarce regions.

Table 8: Migration Census Data

	Climate Characteristics	Average Change in % Migration
Beni	Lowland, Water Rich	4.50
Cochabamba	Valley Region, Water Intermediate	6.22
Oruro	Highland, Water Scarce	8.87

CHAPTER 5: DISCUSSION & CONCLUSION

Discussion

While the data that would demonstrate most efficiently the reality of the situation in Bolivia is scarce, providing specific examples of sources can contribute to a better understanding. Taken together, these sources offer insight into the relationship among water scarcity, migration, and women. By analyzing sources that address these issues specifically in Bolivia, this paper demonstrates the prevalence and importance of their occurrence in Bolivia. Based upon these data analyses, I propose relating these issues, suggesting a relationship between environmental migration and the gendered effects of water scarcity, and seek to understand its implications.

The first component of the paper demonstrated the gendered effects of water scarcity, which was supported by abounding data. Wutich's data presented the typical ways in which one might think of the disproportionate effects of water scarcity on women but also emphasized the differences in intimacy by which men and women interact with water and thus lay foundation for the idea that women are more affected by issues of water scarcity because of their everyday use of water. Wutich's claim was corroborated by nearly every source, if not explicitly then through visual confirmation. News videos that discussed issues of water scarcity highlighted women, and "Mi Agua" provided a specific case study that clearly underscored women as having the most interaction with water. Demographic and Health Household Survey data corroborated Wutich's work and served to establish the situation at the household level, both in terms of gendered roles, as

well as the water situation at these homes. The survey responses demonstrated the time that it takes to perform certain household chores, a fact reflected in many of the news videos. While research often focuses on numbers surrounding the time it takes to retrieve water, it neglects other time-consuming activities such as conserving, allocating, and cleaning water. Coupled with a lack of technology/resources, time is an enormous factor in women's role in water, which has serious consequences for women's ability to participate in empowering activities and institutions (education, employment, etc.). "Mi Agua" demonstrates this beautifully, as the woman reflects on some of the things she would like to do with water (clean her home, water the plants), but is unable to do because of a lack of both adequate water and time ("Mi Agua"). On top of the inordinate amount of time spent carrying out these chores, women work to earn some basic income for their family. Women often reported working outside the home but also being the head of the household, thus suggesting women's dichotomous relationship with the home and its chores.

Furthermore, environmental migration was demonstrated to be an important reality in Bolivia through both video and census data analysis. The Project Earth video and various other news sources provided both visual and verbal confirmation of the stressors that water scarcity has and how it acts as a "push factor" for residents, causing them to move. This data was again confirmed in the census analysis performed on regions varying in general water-availability. By demonstrating through general census data that people are apt to move in instances of water scarcity and by further visual confirmation of the truly arid and dire situation in Bolivia with glacier melt and extreme

weather events, the research confirmed the phenomenon of environmental migration in Bolivia, which mostly occurs among males, leaving women behind.

Though unestablished at a global level, several studies in Bolivia have demonstrated that an increase in outmigration of men does not correspond with an increased empowerment of women. Instead, women take on additional chores to their already full list of responsibilities and do not gain any concurrent access to decisions regarding these tasks. Migration due to environmental factors, including water scarcity, therefore mirrors the gendered nature of resource management itself. In an area where women are already disadvantaged, migration seems to exacerbate these challenges. Because of this, one can make explicit the role of migration in the relationship between water scarcity and women's empowerment, a factor which has previously remained hypothetical.

As men migrate to cities to diversify income in the event of water scarcity, women are left behind. The implications of this are hugely important, and it is for this reason that it is important to explicitly link these two phenomena and examine the implications of this research and how environmental migration affects women. There are a few ways in which water scarcity and subsequent environmental migration could play out for women who are the water collectors for their homes. In one hypothetical, as men migrate out, women are left behind to perform household chores, rearing of children, etc., alone. The inequality and gaps already existing between men and women's lifestyles is exacerbated. However, there is potential for the reversal of such a trend. As men migrate out, women are left alone, with increased independence. It remains unclear whether the implications for this increased independence are met with a corresponding *increase* or

decrease in empowerment, and the implications for this research are vital in order to address this question and encourage the empowerment of women in these situations.

There are a few, broad action steps that can be taken in light of the water crisis in Bolivia. First of all, the government should address the reality of the multiple influences in this issue and focus on some preventative action as well as their current plans on investments. The government should make more effort to address human-caused factors of this water crisis and should furthermore invest in sustainable infrastructure. Action groups should pressure the government to make these investments and should address their suspicions of water mismanagement. NGOs, like those referenced in the paper, can supplement the government's large-scale efforts by helping to provide resources, services, and even infrastructure to families in need. These should include an increased attention to women's experience of water scarcity and should seek to empower women through these services, as well as services such as workshops and increased participation in decisions surrounding water. It is paramount that any decisions and solutions involve women in their conception and implementation in order to empower and include women, as well as to ensure efficiency and efficacy. While urbanization and the out-migration of men may largely continue, addressing and challenging societal gender roles and expectations can transform the outcomes for women. In the end, this issue is one of human rights, and we should prioritize this issue by acknowledging it as such.

Conclusion

Like most, the Bolivian government likes to highlight its improvements. The small-scale increases they flaunt can be both misleading and unrepresentative of the

population at-large. Particularly in the case of Bolivia, the lack of data can be damning for residents whom I believe water scarcity affects most. Not only does little data exist on the subject, but the existing data is narrow. In many cases, for example, the data available seemed optimistic, sometimes leading me to fall into the trap of thinking outcomes were positive concerning the water situation. In reality, while some minor improvements have been made, the situation in Bolivia continues to deteriorate as climate change progresses causing extreme weather events and mismanagement and corruption continue alongside it. It is important to remember that all of the data in this paper (save the newscasts) originated *before* the 2016 drought and water crisis. Even the 2016 surveys were administered in May – September, whereas the state of emergency in Bolivia was declared in November. Since this data was published, the conditions surrounding water availability have only worsened, and climate change continues to contribute to the drying of lakes and dams. It is important to be mindful that things are likely worse than the numbers portray, either due to lack of data availability or the progression of climate change and weather events since the data was published.

Amidst these changes in climate, no large-scale actions are being made by the government in order to address this situation. These phenomena have even graver implications for vulnerable populations, such as rural, indigenous, poor, and female populations. The implications for inequities across gender have received little attention, and this paper sought to examine the issue of environmental migration in Bolivia and if it contributes to the gendered effects of water scarcity. Because women constitute the group responsible for sourcing water and carrying out water-related household chores, they are often disproportionately affected when water sources are physically scarce or inaccessible

through mismanagement and failing institutions. In seeking to examine the relationship in Bolivia between environmental migration, water scarcity, and gendered issues, this paper used both quantitative and qualitative data analysis in order to confirm these trends in Bolivia. Women in Bolivia are deeply affected by the unavailability of water, and as (mostly) men migrate within Bolivia as a response to this scarcity, women are left behind. Moreover, there are huge implications going forward as conditions worsen and vulnerable populations remain unnoticed and un-empowered. The implications for the result of this process are immense and are one of the important steps of research going forward. Efforts should be focused not only to reverse climate change and other harmful environmental practices in Bolivia but also to draw attention to the conditions of women, including the need to include and empower them in decisions surrounding water accessibility.

Building on this paper, there is great potential for further research in this area. The results of my work lead to an obvious follow-up question. Such a question should examine the effects on women of the out-migration of men due to water scarcity in Bolivia. Potential additions to my study could involve studying the same concept applied to other vulnerable populations, or those that belong to two vulnerable populations (for example, indigenous women in Bolivia). Furthermore, this research has potential to be compared at a regional or global level.

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