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Exploring Paths For Water Services And Human Capabilities In U.S.-Mexico Border Colonias

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EXPLORING PATHS FOR WATER SERVICES AND HUMAN CAPABILITIES IN U.S.-MEXICO BORDER COLONIAS

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DEDICATION

This thesis is dedicated to the residents of Las Pampas and Cochran Mobile Park, who invited me into their homes and taught me much about resilience, creativity, and resourcefulness.

EXPLORING PATHS FOR WATER SERVICES AND HUMAN CAPABILITIES IN U.S.-MEXICO BORDER COLONIAS

by

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My appreciation for Dr. Hargrove stems largely from the many drives we've now taken together to and from the distant corners of West Texas. These drives afforded me ample opportunities to ask him questions about the Rio Grande, farming, rainwater harvesting, community projects, the border, the soft path to water, natural-resource issues, *colonias,* and the like. It has truly been an education. Even more, Dr. Hargrove has refreshed in my mind a commitment to doing work on the ground, to delivering results in the 'here and now', and to working at multiple scales to address problems of environmental injustices—while also contributing to scholarly research. Dr. Hargrove introduced me to the soft path to water and to the many wonderful people I met in Las Pampas. He also organized and coordinated the "Friends of the Soft Path" group at CERM, who deserve an appreciation paragraph of their own.

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about the human capacity for resilience, good-humor, and grit in the midst of difficult circumstances.

ABSTRACT

This thesis examines causes and consequences of water insecurity in *colonias* on the U.S.-Mexico border and explores potential pathways for improving situations wherein low-income households lack reliable access to water and sewer services. *Colonias* are low-income, rural and/or semi-rural communities that lack basic services, such as paved streets, water, and sewer. Through in-depth interviews, surveys, and ethnographic observations, the research presented here describes needs, desires, and capabilities of residents in two high-needs Texas *colonias*. First, findings elucidate the lived experiences of water insecurity in *colonias* households, leading to an argument that lacking water access constitutes a nexus, wherein water insecurity draws in, interacts with, and contributes to a variety of household hardships, including those associated with health, time, stress, and budgets. Second, I trace the discourse around water projects at multiple scales to show how *colonias* residents aspire for water access, mobilize for water access, and yet are continually excluded from such access—a discourse of resistance and exclusion rooted in a neoliberal political ecology. Third, survey results and qualitative analysis consider a novel approach to alleviating water insecurity, particularly in small, remote, and isolated *colonias*, known as the "soft path to water." In brief, the soft path focuses on decentralization, low-cost technology, and water conservation to increase supply and reduce demand. Results indicate *colonias* residents express interest in several soft path strategies and technologies, such as rainwater harvesting and under-the-sink filters. Furthermore, I argue the soft path could fit in with residents' lifestyles and leverage extant funds of knowledge related to plumbing, building, and water strategies to free up human capabilities. Finally, I make a methodological point that qualitative researchers can orient themselves to multiple needs in the

field, seeking critical explanations for problems, while also contributing to applied solutions of the sort that come about through engaged anthropology.

Key words: colonias, soft path to water, water insecurity, funds of knowledge, ethnographic methods, development as freedom, human capabilities

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INTRODUCTION

Access to water for a healthy life is a right generally and explicitly supported under "international law, declarations, and State practice" (Gleick, 1998, p. 5). In fact, as of 2010, after decades of implicit acknowledgement of water's fundamental importance to human life and health, the United Nations formally instantiated the basic human right to water, declaring ''the right to safe and clean drinking water and sanitation as a human right that is essential for the full enjoyment of life and all human rights'' (United Nations General Assembly, Resolution 64/292, 2010). More recently, UN member countries adopted the 2030 Agenda for Sustainable Development. Goal No. 6 of the Agenda, signed in 2015, states that member countries should work together to "ensure availability and sustainable management of water and sanitation for all" (UNSD, 2016).

Despite being a signatory to both agreements, the United States has yet to meet standards for the basic human right to water for all of its residents—claims to the contrary notwithstanding. In international surveys, the U.S. commonly reports 100 percent of its residents enjoy access to safe water and sanitation services (Wescoat et al., 2006). Such claims perpetuate a "pervasive myth" (Jepson, 2014, p. 108) that all residents in the Global North have uniform access to water and sanitary services. But the data tell a different story. Nationwide as of 2015, more than 600,000 households, or about 1.5 million individuals, live without complete plumbing facilities (Jepson and Vandewalle, 2015). Among those who lack basic water and plumbing are the urban homeless, migrant workers, Native Americans on reservations, communities in mountainous regions, settlements on the semi-arid plains, and *colonias* on the U.S.-Mexico border (Wescoat et al., 2007). These residents, as Wescoat et al. observe (2007, p. 801), "do not count among the world's 1.1 billion who lack access to safe drinking water, or 2.4 billion who lack access to

improved sanitation." Kept in the shadows and uncounted, these unserved populations constitute a challenge to the "myth of universal access to water in the U.S." (Wescoat et al., 2007).

Communities situated along the U.S.-Mexico border make up a large contingent of households living in conditions of water insecurity. Called *colonias*, which in Spanish means community or neighborhood, an estimated 839,910 people live in some 2,177 *colonias* (Rural Communities Assistance Partnership, 2015). *Colonias* are variously defined as "impoverished, unincorporated communities" (Jepson, 2014, p. 108), "highly concentrated pockets of poverty" (Davidhizar and Bechtel, 2002, p 301), and "substandard housing developments…where residents lack basic services such as drinking water, sewage treatment, and paved roads" (Texas Attorney General *Colonias* Division, 2019). Of all the U.S. border states, Texas has by far the largest *colonias* population; about 358,024 people live in roughly 1,884 designated Texas *colonias.* Not all *colonia* residents lack water and sanitation services, but a significant proportion does. A combined population of 134,419 residents living in 604 U.S. *colonias* was designated as "high-need" by RCAP (2015), which indicates they lack adequate sewer and/or potable water services. Again, the majority of residents lacking such services reside in Texas—about 67,190 people living in 493 *colonias* (Table 1, Hargrove, Korc, and Del Rio, 2018).

Table 1. Communities/population not served by public water systems and/or wastewater treatment facilities relative to the total.[2]

State	# Colonias Not served/Total	Population Not served/Total (% of total)
AZ	7 / 104	14,242 / 278,209 (5.1)
CA	1 / 35	8,400 / 42,269 (19.9)
NM	81 / 154	44,587 / 157,408 (28.3)
TX	493 / 1884	67,190 / 358,024 (18.8)
Total	604 / 2177	134,419 / 839,910 (16.0)

Over the past three decades, increased public attention galvanized investment in Texas *colonias*—efforts which made considerable progress toward the provision of basic water and

wastewater services (RCAP, 2015; Barton et al., 2015). Nevertheless, challenges remain. For the nearly 70,000 Texas *colonias* households without reliable water and sewer access, most of whom earn low and/or fixed incomes, inadequate services present an array of hardships related to health, budgets, time, stress, and emotional affect. Jepson has termed these communities, places where low incomes and social exclusion meet precarious, costly, or non-existent water services, "no-win waterscapes" (Jepson, 2014).

From the perspective of achieving international goals, then, the U.S. has much work to do in low-income communities, including those along the U.S.-Mexico border. Moreover, the toll in terms of human hardship, distress, and disease resulting from failure to provide basic water services is not only well documented, but demanding of attention and solutions (see Davidhizar and Bechtel, 2002; Hargrove et al., 2017; Hargrove and Del Rio, 2017; Cardenas, 2010; and Jepson, 2014). In light of these conditions, this thesis examines household water insecurity in two high-needs communities, both of which are found in Texas counties where large *colonias* populations exist. Cochran Mobile Park is located in El Paso County, home to 74,948 *colonias* residents, of which an estimated 16,692 lack basic, reliable water and/or sewer services. The second location, known as Las Pampas ('the prairies' or 'the grasslands') is located in Presidio, Texas. Roughly 475 Presidio County residents live in designated *colonias*, and, according to RCAP (2015), all 475 live in "priority 1" or "priority 2" areas, meaning they lack reliable water and/or wastewater infrastructure.

For this thesis, I present results in three broad sections, each of which is aimed at understanding the day-to-day realities of water insecurity, the causes and drivers of such realities, and suggestions for their potential improvement. Results are based on eight months of fieldwork (February-September 2019), including repeat visits, semi-structured interviews,

surveys, and ethnographic observations, wherein I asked residents to show me how water came to, moved throughout, and exited their properties, and asked decision-makers to explain why Cochran, and *colonias* like it, still lack water and sewer services. In the first section, I provide results on the conditions observed in Cochran Mobile Park and Las Pampas, including a comparative economic analysis of water costs and an in-depth view of how water insecurity itself forms a nexus constitutive of a variety of quotidian burdens, impinging on time, financial budgets, health, and emotional well-being. In the second section, I focus on Cochran Mobile Park to trace a discourse of resistance and exclusion. I outline how Cochran residents, in their attempts to mobilize for water access, contest the norms by which they are continually excluded from water infrastructure. I bring these contestations into conversation with the rationales offered by stakeholders from local utilities, state and federal agencies, county commissioners, county engineers, and the offices of a state representative—collectively "decision-makers"—to describe, in a new and novel way, the discourse of exclusion and its attendant set of barriers to water access. In describing this discourse of exclusion, I demonstrate how the decision-makers themselves, most of whom express a desire to provide Cochran residents with water access, give accounts of being hamstrung and constrained by a lack of funds for water-infrastructure projects, this as a result of a burgeoning funding shortfall for environmental-infrastructure projects in the borderlands. I ascribe this funding shortfall, little discussed in the press or academic literature, to an overarching neoliberal political ecology.

Finally, I offer an examination of the "soft path" to water as a potential alternative to doing nothing in particularly small, remote, and isolated *colonias*. With its focus on conservation and improving water quality and supply through decentralized means—techniques like laundry-to-landscape greywater use, rainwater harvesting, under-the-sink water filtration, and

decentralized sewage treatment and reuse—the soft path has been suggested as a means for ameliorating water insecurity in *colonias* (Hargrove et al., 2017). Until now, however, no research has been conducted to understand what *colonias* residents themselves think about soft-path strategies. Do residents envision that soft path techniques, tools, and practices would be potentially beneficial? Would such technologies and strategies fit in with *colonias* residents' lifestyles? To what extent do residents view the soft path as a solution or supplement to improve the situations of water insecurity in which they reside? In pursuit of these questions, I discerned a potentially synergistic relationship between several soft path strategies and existing bodies of knowledge among colonias householders. I present evidence that, working in tandem, the soft path and these "funds of knowledge" (Vélez-Ibáñez and Greenberg, 1992) could help free up human capabilities.

Throughout the work in the field and the analysis of the text, I took the "development as freedom" approach espoused by Amartya Sen (1999), wherein the merits of a development proposition are judged on the basis of its ability to ameliorate human capabilities. Underscored in this framework is the idea that substantive "unfreedoms," like lack of access to water and food, stand in the way of expanding human capabilities. Development projects often proceed without an adequate understanding of what the end-user thinks, cares about, or is capable of implementing in day-to-day life. By rushing to put in place technological solutions, researchers and developers risk overlooking a crucial ingredient: human behavior itself. And while technocentric solutions might overlook the capabilities and desires of end-users, highly theoretical academic approaches might miss important opportunities to use development and its tools as a means for expanding human freedom. The research presented here inserts itself between those two poles on the continuum. By putting the people before the "things" *and* the

theories, I sought to discover what *colonias* residents themselves thought of as just, meaningful, and pragmatic solutions for bringing water and sanitary services to their communities—be they small-scale, decentralized interventions, such as rainwater harvesting and low-flush toilets (ideas advanced under the soft-path to water theory); be they larger policy overhauls meant to revolutionize the neoliberal system that set the stage for, and continually reproduce, unjust conditions in the first place, or—assuming the two need not be mutually exclusive—be they some combination thereof. In light to the litany of hardships to which this thesis soon turns, hardships which form part of the daily lived reality of low-income residents in *colonias* populations, it is incumbent on society to find ways to provide low-income residents with sufficient water to live happy, healthy lives. In thinking of water insecurity as a nexus, articulating with and exacerbating a host of additional hardships, or "unfreedoms," this thesis aims at presenting policy and applied methods for improving the ongoing environmental injustice of water insecurity in the borderlands and beyond. Helping to clear a variety of paths for that goal is this study's ultimate purpose.

CHAPTER 1: LITERATURE REVIEW

1.1: Water scarcity vs. water insecurity

To begin, we need to establish basic concepts for defining and describing situations where poverty and water issues intersect. Minimal human water needs are 3-7 liters per capita daily (lpcd) for drinking and 50 lpcd for consumption and household use (Gleick, 1996). People living in situations where these minimal amounts are not met are said to be living in water scarcity. Quantifications for water scarcity were derived in consideration of clean drinking water for survival, human hygiene, sanitation services, and "modest household needs for preparing food" (Gleick, 1996). Insecurity, meanwhile, is a "broader, multifaceted concept that encompasses resource scarcity, resource access, and lifestyle concerns" (Wutich and Brewis, 2014, p. 445). Borrowing from the FAO's definition of food security as a "a situation that exists when all people, at all times, have physical, social, and economic access to sufficient, safe, and nutritious food that meets their dietary needs and food preferences for an active and healthy life," Webb and Iskandarani (1998, p. 4) defined water security as "access by all individuals at all times to sufficient safe water for a healthy and productive life." Similarly, Jepson (2014) advances a definition of water security in the domain of human development, "where water security is broadly understood as adequate, reliable, and affordable water for a healthy life" (p. 109).

Parsing out the differences between water scarcity and water insecurity matters here because few households I visited face chronic water scarcity. By and large, *colonias* residents have the means to gather 57 lpcd. Achieving water *security,* however, is another matter. Water-related injustices begin to enter the story as low-income *colonias* residents pay more for water of inferior quality, endure an array of hardships in meeting their basic water needs, struggle with

breakages and discontinuations in their water supplies, and are kept in states of water precarity, which is to say, one disaster removed from entering the more drastic and dangerous state of water scarcity. These findings are presented and analyzed in some detail in chapter 3, with the intention of diagnosing circumstances generating water insecurity, understanding how residents cope with water insecurity, and illuminating potential pathways out of water-insecure states.

1.2: *Colonias:* A history of exclusion

Colonias are neither inevitable nor randomly occurring phenomena, but rather owe their emergence and continued existence to labor and capital reproduction in a society largely structured by the market (Ward, 1999). Historically, *colonias* developed as people migrated to the border seeking work in industries, such as farming, service, and factory work (Martinez, 2018). These industries came to exist on the border to take advantage of low wages, which were in turn kept low by the large and tractable labor force. A succession of government programs fostered the border's rapid industrialization, including the Bracero Program (1941-1964), the Border Industrialization Program (1965), and the North American Free Trade Agreement (1994) (Martinez, 2018). These pro-industry programs were designed to generate and consolidate wealth by taking advantage of border processes, facilitating the flow of capital and goods, attracting a large labor force, and rendering it always available (Fernandez-Kelly, 1984). They also facilitated the border region's rapid urbanization (Ward, 1999). Through economic boom and bust, the working class was kept in a state of precarity—co-opted to partake in the creation of wealth but by and large excluded from the prosperity they themselves had a primary role in creating. When economies plunged, workers were laid off en masse. When higher wages were demanded, factories simply reached deeper into the large Mexican labor pool. Thus, border industrialization functioned as a magnet, consolidating industry, environmental problems, and

working-class people in the desert, and wealth in the hands of the capitalist class (Martinez, 2018; Fernandez-Kelly, 1984; Ward 1999).

As people came to the border to work the fields and on assembly lines, many stayed, starting families and seeking places and spaces in which they could reside. Low as they were, wages dictated that residences had to be inexpensive. People were quite literally marginalized (Cavanagh, 2001), forced to the edges and outskirts of border cities, which were themselves overwhelmed by large waves of migration. Municipalities could not keep up with booming populations (Ward, 1999; Martinez, 2018). Communities sprung up absent proper planning, and these communities expanded and matured without the benefit of basic services. Self-help housing was built on cheap, unimproved land. These developments paralleled one another on either side of the border. Writes Ward (1999):

> Economic activity in the border region has generated low-wage employment, whether in the maquilas in Mexico or in the service activities on the Texas side. Migration and high rates of urbanization in border cities, in combination with widespread poverty and the inability of either the public sector or the private not-for-profit sector to match demand, have led to settlement development which shares many of the characteristics of that in developing countries. Wages are low and housing is developed privately, and is typically self-organized and sometimes self-built with minimal services—if any at all (p. 69).

In many cases on the U.S. side, lax housing laws and policies allowed for unscrupulous developers to take advantage of vulnerable, out-of-place migrant communities (Ward 1999). Developers bought tracts of land in remote, barren desert locations—places specifically selected because building and development practices were not closely monitored. They parceled out the

purchased land into units, neglecting to connect the "development" to water, electricity, sewage, and the like, and sold those units to poor laborers on a Contract for Deed basis. At the time, the Contract for Deed mechanism (subsequently outlawed), permitted land to be subdivided and sold without services under terms which were poorly understood by buyers. Contracts for Deed lacked provisions to protect buyers' equity; equity did not transfer until payment had been made in full. In this scheme, many developers offered financing, imposing steep interest rates. When low-income buyers missed payments, owners could—and often did—seize the land, regardless of how close residents had come to payment-in-full (Ward 1999).

Near the end of the 20th Century, public outcry prompted the state of Texas to begin changing laws and investing in services for *colonias* residents (Barton et al., 2015). Meanwhile, *colonias* residents themselves showed agency and resilience, developing grassroots networks of activism, support, and funds of knowledge. In many cases, *colonias* evolved over time into "integrated working-class districts with paved roads, services installed, and consolidated dwellings…"(Ward, 1999, p. 1), a phenomenon of working-class organizing and *colonia* maturation which prompted Ward (1999) to describe them as "both a problem and a solution" (p. 1). However, for many thousands still living in *colonias* without proper services, poor environmental conditions persist, especially in the many small, remote, and isolated colonias that dot the borderlands.

1.3: Water and health impacts in *colonias*

For decades, public health studies in *colonias* have underscored the relationship between disease, illness, and inadequate access to potable water and sewerage (for examples see Davidhizar and Bechtel, 1999; Cardenas et al., 2010; and Hargrove et al., 2015.) Lacking water services leads to health issues for a variety of reasons. For one, households often try to meet their

water needs by purchasing hauled water, a strategy that makes supplies vulnerable to contamination. Private hauling companies frequently fail to deliver water that meets standards for potability. Not only that, but hauled water must be stored in drums and tanks and delivered into households through makeshift configurations of storage and piping. Tanks are difficult to clean and maintain, and pumps frequently break, leading to interruptions in service and/or degradations in water quality. Alternatively, people sink shallow wells and draw water from groundwater sources. These sources are increasingly likely to be contaminated by failing septic tanks, pit latrines, and cesspools, since communities lack proper sewage disposal systems and aging septic tanks are prone to failure. "Given the appalling environmental conditions," writes Ward (1999, p. 3) of U.S. *colonias*, "diseases are endemic, and the rates of shigellosis and hepatitis A are more than twice the U.S. rate."

Indeed, the catalog of health issues in *colonias* is both lengthy and diverse. Davidhizar and Bechtel (1999) describe measles, mumps, and rubella—preventable communicable diseases—occurring in *colonias* at rates much higher than in the at-large U.S. population. In their study of U.S.-Mexico urban border populations, Cardenas et al. (2010) found a number of pervasive gastrointestinal pathogens. In particular, Helicobacter pylori (H. pylori), an infectious disease whose transmission is often associated with fecal contamination of water, was found in the digestive tracts of 38% of residents studied.

Leach et. al (2000) conducted an epidemiological study to find the prevalence of cryptosporidium parvum (*C. parvum*) in children living in *colonias* and urban communities along the border. The study analyzed the presence of anticryptosporidial antibodies in children's bodies, an indicator of past infection. Their data indicated an extremely high prevalence of infection with the intestinal parasite, whose symptoms include diarrhea, vomiting, nausea,

stomach cramps, and fever. Prevalence among children living in low-income urban border communities was 82% and *colonias* was 89%, rates which were "comparable to the prevalence observed in developing countries such as Brazil and Venezuela" (Leach et al., 2000, p. 660).

Within colonias, Leach et. al (2000) identified consumption of municipal water instead of bottled water, older age, and lower household income as independent risk factors. They also found that children living along the Texas-Mexico border have a higher rate of infection with *C. parvum* compared to children living in a large non-border urban area. In a separate study (Leach et. al., 1999), researchers found that children living in *colonias* along the border had a significantly higher prevalence of hepatitis A virus infection (37 percent) than children living in urban border communities (17 percent) or in a large metropolitan area (San Antonio, 6 percent). The authors isolated *colonia* residence as an independent risk factor for hepatitis A infection. To underscore the importance of clean water, the authors pointed out that the use of bottled water, instead of municipal and/or well water, was protective against hepatitis A.

It is evident that lacking water leads to serious public-health concerns. Conversely, evidence also demonstrates that *getting* water services leads to community-wide health improvements. When the North American Free Trade Agreement was passed in 1994, environmental and human-health advocates pushed for the inclusion of a side agreement that would set aside funding for water and wastewater improvements along the border. As a consequence, in the latter half of the 1990s, a major effort was made to connect households to conventional sewage and piped-water infrastructure. These developments were coincident with a precipitous decline in the incidence of Hepatitis A (see Fig. 1).Thus Hargrove and Del Rio (2017) concluded: "At least some of the decrease in incidence in El Paso County can be

attributed to the large effort to connect households to piped potable water during the late 1990s" (p. 29).

In a retrospective study of two West Texas colonias that received first-time water infrastructure, Hargrove and Del Rio (2017) documented a variety of benefits. Residents reported fewer incidents of Hepatitis A, gastrointestinal illnesses, stomach infections, bleeding ulcers, neuropathy, skin irritation/infections, mental stress/anxiety, and vector borne diseases like West Nile Virus. Other post-water project benefits included an estimated 10-12 percent increase in property values; growth in local businesses and jobs; improved local health care, with access to more clinics; an increase in parks and recreational areas; and improved public safety due to fire hydrants (Hargrove and Del Rio 2017). Taking a long-term view of Hepatitis A in Texas and El Paso County, Hargrove and Del Rio (2017) chart a sharp decline in the incidence of the disease, especially along the border. These spin-off benefits show that water is foundational to a community's health and development, spilling over into multiple domains.

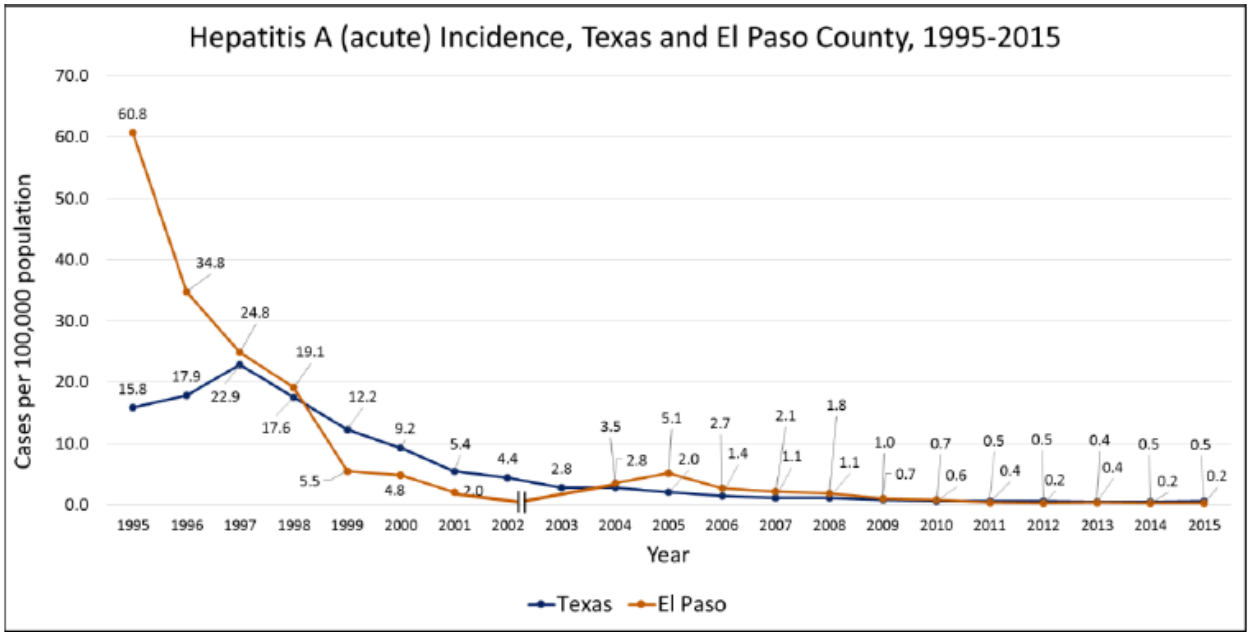

Figure 1: Hepatitis A incidence in Texas and El Paso County, 1995-2015

1.4: Economic, environmental, and social justice

Given the history of marginalization in the production of borderland *colonias*, several researchers have argued that society, in failing to provide basic services, has thrust an undue economic burden on low-income border populations, many of whom live below the federal poverty level. *Colonias* residents often resort to costly, alternative sources for their basic water requirements, including private wells, water kiosks, private water-supply companies, and/or hauling water from distant locations. By taking these measures, residents spend more time in the process of obtaining water for their daily needs, devote a greater percentage of their income to purchasing water, and pay more for water on a per-gallon basis than people living in cities and towns (Hargrove and Del Rio, 2017). Even with increased investment and effort on the part of residents to meet their daily water needs, the supply chains by which water arrives into and exits from *colonias* households are often precarious—subject to breakages and discontinuations. Additionally, water from alternative sources is of varying quality: Private wells tap contaminated groundwater; old, unregulated septic tanks fail; and household water-storage tanks contaminate the hauled supply (Jepson, 2014; Vandewalle and Jepson, 2016).

All of these documented issues produce household water situations in the United States reminiscent of those observed in underdeveloped countries, and they exacerbate the prevalence of waterborne illness and disease in *colonias* communities. Consequently, addressing wastewater and potable water needs is an important task for remedying environmental injustice in *colonias*, the measure of which is the extent of "disproportionate negative environmental impacts on socially marginalized people" (Grineski and Juarez-Carrillo, 2012, p. 179).

Aside from health and household-economic effects, recent studies have begun to note degrees of emotional distress experienced by residents who lack conventional water access and

treatment (Garcia et al. 2016; Jepson 2014; Vandewalle and Jepson, 2016). One study (Garcia et al., 2016) gathered social data from *colonias* residents in west Texas and southern New Mexico on what they themselves thought about their water. The study found 67% of those surveyed perceived their water was unsafe to drink; 72% thought it had a bad smell and taste; 73% thought it was contaminated with chemicals; and 44% attributed their experiences of intestinal illness entirely to their water sources. Despite these facts, many residents still used this water for such basic household purposes as cooking, bathing, and brushing their teeth (Garcia et al., 2016). These findings speak to the distress, pain, and suffering that arise from lacking consistent quality water and sanitation services.

Finally, as a matter of economic cost-benefits, evidence suggests that first-time water- and wastewater-service projects pay for themselves in the long run, ultimately saving society money, especially in preventative healthcare costs for waterborne ailments and disease. As Hargrove and Del Rio (2017) found, water service boosted property values, thus allowing residents to generate more revenue in property taxes to state and local government. Second, the authors documented an increase in businesses as water-services spurred economic development. Likewise, in a separate study (Haas et al., 1996) conducted a cost-benefit analysis of a project to improve water supply and sanitation infrastructure in a *colonia*. The hypothetical scenario envisioned a community with about 6,800 residents, modeled on San Elizario, Texas, a community which, at the time, lacked access to clean water. Over a 26-year time horizon, the costs in the scenario without improvements tallied $42,937,507, whereas costs with improvements were $34,600,800—more than $8 million less. Increased land values and time savings accounted for the majority of these savings. Additionally, the authors estimated that access to safe drinking water would prevent 155 instances of Hepatitis A and 5,165 cases of

gastrointestinal illnesses over 26 years, saving $846,541—or nearly 10 percent of the estimated savings—in associated health care costs. Thus, Haass et al. (1996) argued: "Although society would incur large capital investment costs in the project-implementation scenario, ready access to water and sanitation would 1) promote better health, 2) reduce water-acquisition costs, 3) improve environmental conditions, and 4) increase property values."

1.5: Current challenges and a proposed path forward

Few researchers disagree with the notion that *colonias* residents share in the basic human right to water. The harder questions to answer deal with the larger structural conditions that form the backdrop and obstacles to providing basic water services. By understanding the thinking on these structures, which include spatial as well as sociopolitical structures, we can more accurately derive an appropriate means by which water services could be provided. Hargrove et al. (2017) posit that many *colonias* remain in conditions of water poverty in large part because they are "small, remote, and isolated." According to the Housing Assistance Council, for example, most Texas *colonias* have fewer than 40 lots, whereas large *colonias*—those with at least 300 units—account for only 7 percent of Texas *colonias* (Housing Assistance Council, 2012). In isolation, these groupings of households are small. In aggregate, however, they make up a large population. About 25 percent of the *colonias* population, or 134,419 individuals, still lack adequate water and wastewater services (Hargrove et al. 2017).

For larger communities, a combination of loans and grants for conventional, "hard-engineered" infrastructure might meet funding guidelines in terms of per-capita expenditures for water projects. For this reason, many such projects have been carried out. By contrast, conventional water access for small, remote, and isolated communities is difficult to obtain. Such access requires greater capital outlays for the benefit of smaller groups of people. It is more

expensive on a per-capita basis to run water or sewerage to a small community located at a distant remove from an urban center than it would be to run water or sewerage to a large community situated at a city's edge. Additionally, funding for such programs is generally in decline. In the latter half of the 1990s, for example, the Border Water Infrastructure Program, administered by the North American Development Bank and Border Environment Cooperation Commission, routinely received over $100 million annually for water-improvement projects. In 2018, by contrast, BWIP received $15 million in funding (NADB director, personal communication, 2019). For these reasons, Hargrove et al. (2017) have suggested the "soft path to water" as a potential supplement and/or alternative for residents living in no-win waterscapes.

1.6: The hard path vs. the soft path to water in *colonias*

The soft path to water is best understood in contrast with the "hard-engineered" or "hard path" to water. The latter refers broadly to the conventional set of technologies, regulations, practices, and ideas for delivering wastewater and potable-water services (Gleick, 2012; Brooks and Holtz, 2009). These include major, centralized infrastructure projects, dammed rivers, the formation of large reservoirs, sprawling irrigation networks, centralized treatment systems, and extensive water-supply pipelines. The hard path has contributed much to human society and civilization. To the hard path goes credit for delivering clean, running water to the homes of billions of people worldwide. Increasingly, however, the hard path has come under criticism for its negative ramifications, especially those related to social exclusion and environmental vitiation. The hard path, according to its critics, is predicated on an endless-growth mindset—big technological projects, the "hard" engineering of nature, a fixation on large-scale development. The "hard-path" idea is always to get more: More exploration. More expansion. More supply (Gleick, 2012).

The soft path, by contrast, focuses on small-scale, decentralized solutions for water treatment and supply. It does not necessarily seek to replace the hard path altogether, but rather complements it through investment in "decentralized facilities, efficient technologies and policies, and human capital" (Gleick, 2012, p. 373). The soft path emphasizes the productive use of water to meet water-related needs—that is, providing the goods and services people want while using as little water as possible. In this way, soft-path thinking detaches economic growth from the previously assumed necessity of ever-increasing water supply and demand. Instead, resilient communities work together with governments, nonprofits, and private companies to meet water-related needs in a manner that integrates ecological health as a "fundamental component of water policy" (Gleick, 2012, p. 373). The soft path tries to reduce water waste and matches water supply and quality with water use, for example, by recycling sewer water through decentralized treatment plants for potable reuse or by using "greywater" to grow trees or water landscapes (Gleick, 2012).

The soft path can be applied to communities and watersheds at different scales. In its fullest iteration, the soft path offers a community-watershed scale planning protocol: seven steps based in soft-path principles through which water managers can work with community stakeholders to identify water sources and water concerns, project water usage into the future, and set planning goals for sustainable consumption and supply. Working backwards from future goals, soft-path planning then promulgates policies for conservation and builds-out technological interventions (Brooks and Holtz, 2009).

While these particular case studies might glean useful information for such an effort, the creation of a watershed-wide "soft-path plan" is not this study's focus. Rather, the research

intends to assess whether certain small-scale soft-path interventions might be useful in improving water security for low-income households in *colonias* that are particularly difficult to reach.

1.7: A relational approach to the hydrosocial waterscape

The stark environmental realities in *colonias* raise critical concerns about the structural conditions embedded in what has been termed the "hydrosocial waterscape" (Jepson and Vandewalle, 2015, p. 67), a system that encompasses an array of intersecting phenomena, infrastructure being just one of the component parts. The hydrosocial waterscape includes geography, knowledge circuits, technological devices, organizations, institutional practices, and governance regimes, among other factors, all of which interact in complex ways to determine if and how clean water comes into the household or is properly treated as it leaves. Importantly, as Vandewalle and Jepson (2015) state, "social and political practices mediate these circuits that allocate water flows and hydrological services…" (p. 67). Conceptualizing the hydrosocial waterscape in this way calls attention to the need for social researchers to examine its linkages and relationships—and their breakages—as they intersect, detach, interact, and diverge.

The relational perspective thus demands fuller consideration of what goes into fostering conditions of water security, attending to such broad aspects of the hydrosocial cycle as market forces and market assumptions, governance structures, entitlements, geography, racial, gender, and cultural classifications, social relations of access, and even the "meanings of water and customary practices that are not easily captured by standardized metrics" (Jepson et al., 2017, p. 2). With the hydrosocial waterscape in view, a researcher, for instance, would not likely accept that lack of funding is the *raison d'etre* of no-win waterscapes in the global North. An adequate explanation would have to go deeper. What complex web of power relations, historical factors, and sociopolitical values make it possible for society to pin the blame on "lack of funding"? How

do these values undergird a system that discursively reproduces colonias without clean-water access? What, in other words, is the shape of that complex web? And how does it function?

Asking questions like these, taking the "relational approach" to water and sanitation services, Vandewall, Jepson, and others vastly expand the realm and array of forces that militate against clean-water services, and they do so with interesting results. In their study of south-Texas water vending machines, Jepson and Brown (2014) explore how neoliberal discourse normalizes the existence of U.S. *colonias* communities without access to clean water and sewage, "enrolling residents as neoliberal subjects" (p. 1032). Over time, it becomes acceptable for residents to be disciplined "water consumers," meaning individuals who *purchase* drinking water from vending machines. This normalization occurs under a hegemonic neoliberal ideology, one which manifests an invisible hand that guides its subjects into acquiescence. Heyman (2003), in his evaluation of the subtleties of power, describes this process of normalization as occurring through the '*superordinates*' (those with power) "shaping the perceptions and will of subordinates, resulting in acquiescence, indeed positive support, in the face of harm to the welfare interests of the subordinates (roughly, the Gramscian position)" (p. 142).

In *colonias*, this "shaping of perceptions" inheres in a process of *institutional enclosure*, "the creation or repurposing of institutions to limit public participation in water governance" (Jepson and Brown, 2014, p. 1032). Via institutional enclosure, labor and costs for acquiring acceptable water shift from "the body politic to the individual" (p. 1034). Over time, and owing to "slippages in state accountability" (p. 1035) alongside household exigencies of need, individuals' political subjectivities reposition. Conditions set by the hydrosocial waterscape push residents into the water market, into being *consumers* of water—that is, people who purchase water from vending machines—and, over time, they acquiesce in their fight to gain access to

water from the State, or the body politic, and come to accept their position as consumers. “Water governance experienced a slow process of institutional enclosure,” Jepson and Brown summarize (2014, p. 1040). “The cumulative impact narrowed the arena in which colonias residents could make claims on the state and, therefore, they turned to the market.”

In a separate critical evaluation of relationships in the hydrosocial cycle, Vandewalle and Jepson (2015) turn their attention to a “state-market-university alliance” that uses household-water-treatment devices to open new markets and produce new consumers in *colonias*. They examine a $500,000 Environmental Protection Agency-sponsored pilot project undertaken by university researchers to test the feasibility of household-water-treatment systems as a means to alleviate potable water issues in *colonias*. “While the state’s failure to provide potable water to *colonia* communities in Texas created a demand for some intervention,” they argue, “the state-market-university alliance behind the development of HWTs produced new opportunities to further neoliberalise and individualise water quality management to the household…(and) these forces deepen neoliberalisation of the water sector in the global North” (Vandewalle and Jepson, 2015, p. 2).

For corporations who manufacture and distribute household-water-treatment devices, it is difficult to sell directly to end-users, because most low-income families cannot afford the devices (Vandewall and Jepson, 2015). To accelerate their products’ distribution, corporations seek partnerships with non-profit organizations, universities, and agencies. Meanwhile, the “place-particularity” of *colonias*, labeled as third-world relics out of place in first-world context, discursively permits an inferior solution (household-water-treatment devices) to sub in for piped water infrastructure. A convergence of factors, including roles played by state agencies and university researchers, leads to the normalization of household-water-treatment devices as

adequate, low-cost "fixes" in low-income households. In the end, *colonias* residents become enrolled (by the neoliberal market's incursion into their communities) as water-filter consumers and are made to view as acceptable a technological quick-fix that would not be tolerated in U.S. communities elsewhere.

In both examples—water-vending machines and household-water-treatment devices—Jepson, Brown, and Vandewalle level important criticisms on the neoliberal, or market-based approach, to delivering water. In this frame of thinking, society need not simply provide new technologies, which only serve to mediate relations and expand neoliberal markets, but should reorient public policy in ways that can "materially improve drinking water quality for the marginalized in the Global North" (Jepson and Vandewalle, 2015). They advocate a human-capabilities approach to water security, one which goes beyond viewing water as a material commodity to be secured, but rather concerns itself with relationships that underpin water in all its fluidity (Jepson et al., 2017, p. 5):

> From our perspective, water security, then, is not simply a state of adequate water—however defined—to be achieved, but rather a relationship that describes how individuals, households, and communities navigate and transform hydro-social relations to access the water that they need and in ways that support the sustained development of human capabilities and wellbeing in their full breadth and scope.

1.8: Decentralized infrastructure and household water treatment: Powerful tools or traps of low adherence?

While Vandewalle and Jepson direct our attention to relationships in the hydrosocial cycle, Meehan (2014) focuses on objects themselves. She describes technologies, such as infrastructure and household tools, as powerful conveyances and mediators within the

waterscape. She traces the development of water infrastructure at different scales in Tijuana, arguing that water laws, flood control, and potable water networks cemented residents' dependency on the Mexican state. Working against state control, common infrastructures of water supply—such as rainwater-gathering tools like barrels, cisterns, and buckets—coexist with state infrastructure, allowing residents to carve out a degree of authority and autonomy within their own water supplies. All these objects in articulation are wellsprings of power, directing flows and access to water, and changing how people interact with water and with each other.

While Meehan focuses on the potentiality and capacity for infrastructure, tools, and objects to shift power in the hydrosocial waterscape, Schmidt and Cairncross (2008) call attention to the limits of low-cost technology for household water treatment in poor populations. These authors "reviewed the evidence on acceptability, scalability, adverse effects, and non-health benefits," and found that the "acceptability and scalability of household water treatment (HWT) is still unclear, and that there are substantial barriers making it difficult to identify populations that would benefit…" (Schmidt and Cairncross, 2008, p. 986). In some cases, their critiques echo those of Vandewall and Jepson (2015), as when they point out that household water treatment may have "adverse effects in three dimensions: risk to the consumer (e.g., toxicity), diversion of household income and time/effort from other activities, and the risk that political attention is diverted from water supply" (p. 987).

Along this same line of thinking, Brown and Clasen (2012) highlighted that a) there are many reports in low-income areas of low adherence to household water treatment and b) high adherence is essential to realize potential health gains of HWT. "Unlike centrally treated, piped-in water supplies, HWT is normally a batch process that must be undertaken by end-users on a frequent basis in order to provide consistent protection against waterborne pathogens. A

systematic review of chlorine-based HWT…found several studies with adherence under 70 percent." The authors thus concluded that "the potential health gains are reduced sharply with even occasional consumption of untreated drinking water" (Brown and Clasen, 2012, p. 1).

Not all studies of HWT necessarily corroborate these findings. A four-phase project looking directly at point-of-use treatment in El Paso County *colonias* found that many residents desired the installation of point-of-use filters under their sinks. (This is the study critically examined by Vandewalle and Jepson above). Once installed, pre- and post-installation surveys, as well as post-installation water quality analyses, were conducted to evaluate the filters' success. The authors found that "*colonia* residents use the POUs, are confident in the water quality, and they save time and money compared to purchasing bottled water." In light of these findings, the researchers stated: "This project has been a major success in concluding that POU RO systems are beneficial for *colonia* residents" (Walker et al. 2015, EPA Project report).

Sullivan and Ward (2012) also take a straightforward look at potential household rehabilitation tools and strategies that could make low-income housing more environmentally sustainable. They argue that the movement for sustainable housing has eschewed low-income communities whose homes are typically self-built, incremental structures. In doing so, society has continued to perpetuate environmental injustices on *colonias* residents, while simultaneously hamstringing any "significant and meaningful inroads into achieving more sustainable housing" (p. 313). They argue that "green" applications should be made accessible to low-income, informal communities "both to improve the quality of life of the residents as well as to benefit the environment" (p. 313).

Furthermore, they developed a heuristic which they say can help determine technologies that will fit in with low-income, informal housing. Many water-related technologies—such as in-

sink aerators, water-efficient showerheads, water-pipe insulation, rainwater harvesting, greywater systems, and low-flush toilets—ranked highly in their estimation, when measured in terms of upfront cost, labor intensiveness, ease of maintenance, savings, and human capital. Other technologies, such as aerobic treatment units and solar-assisted composting toilets, were more labor-intensive and required greater investments in money, time, and human capital (Sullivan and Ward, 2012).

1.9: Pushing the critical discussion: Power's inverse and neoliberalism's limited utility

The various studies described in parts 7 and 8 of this review highlight an ongoing debate as to whether decentralized interventions should play a role in water provision in contexts where the State has abnegated its responsibility to provide piped-in water services. Moreover, the debate raises questions about the applied researcher's role in understanding and advocating for certain ideas and technologies, especially when those ideas and/or technologies might run the risk of expanding neoliberal markets and further entrenching inequities. On the one side of this debate, researchers such as Vandewalle and Jepson argue that targeted interventions amount to quick fixes that fall short of providing equitable solutions to water insecurity; at worst, these "solutions" cause more harm than good. Rather, development practitioners should turn their attention to a new definition of water security, one which holds in focus the power-laden hydrosocial relationships that co-opt residents into neoliberal markets. Interventions cannot "fix" this problem. What society needs is a "transformation" of "underlying conditions," a processual approach which would theoretically usher forth a wholesale "reconceptualization" of the hydrosocial cycle (Jepson et al., 2017, p. 3).

An overhaul of the hydrosocial cycle could result in equitable water distribution to the least well-off members of society; it could also constitute to a larger process of dismantling the

"neoliberalist project." To date, however, no such overhaul has occurred. In the context of *colonias*, progress has been made in fits and starts, with much backsliding. Meanwhile, thousands of low-income residents living in small, remote, isolated *colonias* remain in day-to-day conditions of water insecurity. The long continuation of these conditions underscores limitations to which the critical perspective is fastened. Recognizing these limitations in the wider context of development, some theorists have challenged progressive scholars to deepen the conversation, reaching beyond critical analysis. These theorists do not seek to trivialize the importance of radical (to the roots) critiques of the neoliberal power structures on which inequities, such as water insecurity, are propped. On the contrary, they maintain that such critiques are necessary and vital to an eventual restructuring of the neoliberalist hegemony. Still, a critical position leaves a void. That void calls out for an answer. Could a grounded, positive counter-vision fill that void? And what might such a counter position look like?

In his essay, "The Inverse of Power," Heyman (2003) evaluates the critical tendency to tear harmful structures down, a theoretical razing which leaves want for some sort of positive edifice erected in its place. The "tenor of recent anthropological work is unrelentingly negative and critical," Heyman writes. "There is need for more acknowledgement of constructive ideas and experiences, because they also form part of the human experience, they are what our ethnographic collaborators value and often talk about, and they indict the destructive effects of unequal power as effectively as criticism, if not more so" (Heyman, 2003, p. 12). He calls these alternative structures "counterpart ideals." They work in contrast with power, revealing its contours and inner-workings, and can thus be conceived as "the inverse of power." Problematically, critical ethnographers have continually neglected to discuss these *counterpart ideals*, even though such ideals are ever-present:

> We often hold counterpart ideals implicitly, such as those which value individual capabilities within a culturally rich and socially connected lifeworld. Yet by hiding such ideals either in the pretense of arms'-length scholarship or in assumed, unspoken agreement with politically critical positions, we do a disservice to such ideals, for we do not subject them to open debate (Heyman, 2003, p. 14).

Heyman answers his own critique through the use of "constructive writing," which invites the reader to understand a situation's flaws, but also to envision an alternative reality. In this way, Heyman "constructs" an alternative reality by writing about it, sharing counterpart ideals so that they can then enter a process of being envisioned, understood, debated, and potentially made concrete. Constructive writing involves an understanding of the status quo, so as to say, "This is how things are." But it also employs deeper inferences into a reality that might await, just beyond the horizon, so as to say, "This is how things *could be*."

Anthropologist James Fergusson (2009) takes a similar, but slightly different tack in his essay, "The Uses of Neoliberalism," which lays out a case for deepening the critical discussion around neoliberalism. Scholars, he argues, apply the term so widely and with so many distinct referents, that its definition tends to slip and expand. Neoliberalism, then, appears as a "kind of gigantic, all-powerful first cause," Ferguson asserts, "that malevolent force that causes everything else to happen" (Ferguson, 2009, p. 171). He therefore contends progressive scholarship which stops merely at criticism of neoliberalism runs the risk of returning empty analysis, "since all one can really do with such a gigantic, malevolent thing as neoliberalism conceived in this way is to denounce it. (And *that*, the evidence suggests, doesn't seem to do much good)" (Ferguson, 2009, p. 171).

Fergusson evaluates basic-income transfer programs in African nations to show how certain arts of government borrow from the "neoliberalist bag of tricks" (Ferguson, 2009, p. 174) to achieve ends that are decidedly at odds with what we have conventionally thought of as furthering the neoliberalist project. His essay explores what he terms a "strange conjunction" between pro-poor programs and neoliberalist governmentalities. This conjunction, an apparent paradox, occurs when pro-poor programs co-opt classic neoliberal "moves" for decidedly non-neoliberal outcomes. These initiatives include basic-cash transfers that bill themselves as means to galvanize entrepreneurship and stimulate individual choice, while valorizing market efficiency and expressing skepticism of continuously failing state programs—all of which are classic fare at the table of neoliberal argumentation. His analysis, however, eschews a sweeping, slipping blanket-definition that equates neoliberalism as a "synonym for evil." Instead, he explores the potential for how progressive scholarship can oppose 'the neoliberal project,' and, at the same time, borrow tools from its own toolbox to dismantle it (Ferguson, 2009, p. 173):

> Can we on the left do what the right has, in recent decades, done so successfully, that is, to develop new modes and mechanisms of government? And (perhaps more provocatively) are the neoliberal "arts of government" that have transformed the way that states work in so many places around the world inherently and necessarily conservative, or can they be put to different uses? To ask such questions requires us to be willing at least to imagine the possibility of a truly progressive politics that would also draw on governmental mechanisms that we have become used to terming 'neoliberal.'

The analysis presented later does not go so far as to promote neoliberal forms of governance (nor, for that matter, does Fergusson's essay), but I am interested in how neoliberalism, that malevolent first cause, can steal the conversation and detract from potentially

beneficial development initiatives on the ground. As Heyman points out, our ethnographic collaborators often desire positive outcomes, some sort of material next step, a move in the direction of power's inverse. It is not always helpful in every context to *only* explain the critical position, to pin a circumstance to neoliberalism and stop there, though my position here is that it should be part of the conversation. Instead, engaged researchers can maintain an openness to both—sweeping, sociopolitical critiques and on-the-ground interventions—especially when residents themselves express a desire and/or interest in those interventions, and those interventions show potential for freeing up capabilities.

1.10: Grounding the debate: Development as freedom, funds of knowledge, and water access

Returning the debate outlined in parts 7-9 to the context of *colonias* means attending closely to the particular needs, wishes, and capabilities of *colonias* residents. To do so, I have attempted to unearth rich social information on residents' perceptions of their own water insecurity, including its drivers and their needs and capabilities. I have attended to the wider hydrosocial cycle, which discursively shunts *colonias* communities into 'zones of enclosure,' keeping them in water-precarious states. I have also probed the potentially constructive possibility of various decentralized technologies and ideas, including a range of elements, from water-saving showerheads to household-water treatment systems. These I present not as wholesale alternatives, but as supplements to ameliorate urgent need. Each method supposedly represents a different take on water insecurity, its causes, and solutions. Yet, I argue, these ways of viewing and methods of approach are not so far apart as they are made out to be. Their unification adheres in the capabilities theory advanced by Amartya Sen in his influential work, Development as Freedom (1999), which I'll contextualize now.

Sen holds that development projects should be evaluated on the merits of their ability to free up human capabilities. He presents two metrics for assessment: "The evaluative reason" (Sen, 1999, p. 4), which asks whether freedoms of people are enhanced, and the "effectiveness reason" (Sen, 1999, p. 4), which holds that the achievement of development can only come about through peoples' free agency. The idea, then, is to ensure that people's freedoms are at the center of any development approach—that is, people's freedoms come first.

"Freedoms of different kinds," according to Sen, offer the most robust and substantive means for countering the afflictions of chronic hunger, persistent poverty, violence, and other "unfulfilled elementary needs." Sen terms these unfulfilled needs "unfreedoms." The work of development is to address unfreedoms, as opposed to a singular focus on boosting GNP. "Development consists of the removal of various types of unfreedoms that leave people with little choice and little opportunity of exercising their reasoned agency," he writes (Sen, 1999, preface xii). "The removal of substantial unfreedoms, it is argued here, is *constitutive* of development."

Sen's analysis of freedom is relational. Unfreedoms are freedoms' inversions; they constrain freedoms; thus, they constrain human flourishing. Freedoms, conversely, bring one another in tow; the bolstering of one type of freedom cascades into other types of freedoms. Freedoms tend to reinforce one another, so that economic freedom and the freedom of individual agency and political freedom all work in tandem to further human capabilities and flourishing. The object of development, then, is to set this positive-feedback-freedom loop in motion, and to do so using a variety of instruments.

This last part is important, because it demonstrates Sen's embracing view of freedom and development's role in bringing it about. Sen does not write-out markets, industrialization, or

technological interventions as inherent tools of bad actors ("To be generically against markets would be almost as odd as being generically against conversations between people" (Sen, 1999, p. 6)); nor does he hold them up as silver-bullet mechanisms for solving all societal ills. Instead, he considers these as means among other, perhaps more important, means—such as political and civil rights, liberty to participate in public discussion, education, and adequate health care—for achieving the one, all-encompassing end of human flourishing.

As outlined above, and for a variety of reasons, access to clean water is a first-cause for human flourishing, which is to say, lack of access to the same is a substantial unfreedom. With that in mind, and in approaching this study, I maintained a both/and mindset, attempting to assess the underlying causes in the hydrosocial waterscape that discursively exclude *colonias as well as* interventions that could fit in with the lives of *colonias* residents, potentially alleviating some of the urgent burdens experienced on an ongoing, daily basis. This approach was rooted in Sen's embracing vision of development as freedom such that it avoided ruling out one critique over another and held peoples' agency at its center. I tried to understand that many things can happen at once and that life does not fit into neat categories. My approach was also linked to the exigencies and realities observed in the field; I attempted to put the people before the things. For a solution or a process to be effective, it needs to fit in with the lives, cultures, needs, and realities of residents, and it needs to expand their capabilities.

In the study to follow, I attempted to connect these threads through a project of ethnographic fieldwork on multiple fronts. What solutions are workable? And what solutions do residents desire? This research envisions a link between capabilities theory and "funds of knowledge." Vélez-Ibáñez and Greenberg (1992) have proposed examining "funds of knowledge," which constitute "cultural and strategic resources" that households draw from and

use to adapt to their changing social, economic, political and natural environments. Funds of knowledge are passed from one generation to the next, evolving as certain "funds" are discarded for their irrelevance, while others are selected for in the adaptive struggle for material survival. Funds of knowledge reach beyond the household, often tapping into networks of kinship or household "clusters." Funds of knowledge can therefore be thought of as "the currency of exchange, not only between generations, but also between households, and so form part of the 'cultural glue…'" (Vélez-Ibáñez and Greenberg, 1992, p. 318) in a given social unit.

In their evaluation of Mexican-American working-class families, Vélez-Ibáñez and Greenberg discovered an important common theme: "Each generation struggled against different historical forces, yet their defenses, for the most part, were invariant—human creativity coupled with an enormous ability to mobilize and expand social relations" (Vélez-Ibáñez and Greenberg, 1992, p. 314). Funds of knowledge reveal peoples' agency, resilience, and creativity in coping with the substantial unfreedom of unreliable access to clean water. Thus, these funds offer a point of leverage for development ideas that aim to free-up capabilities—and therein lies their linkage with Sen's capabilities approach. By understanding how such funds operate in a given context, researchers and development practitioners can propose and/or evaluate the degree to which a certain development idea potentially expands existing funds of knowledge. Put differently, if funds of knowledge leverage peoples' capabilities, then a case can be made that expanding such funds concomitantly expands freedom.

CHAPTER 2: FIELD SITES AND METHODS

2.1: Field Site No. 1: Cochran Mobile Park

A highway leads east out of the Town of Horizon City, past the strip malls, the high school, and the water utility, beyond the road called Ascension, and into a vast and open desert, a flat basin of sand and scrub and cacti. Several miles down this road, somewhere between the cities behind and the mountains ahead, a blue street sign reads "Buffalo." Hook a right on this road, driving south toward Mexico, and you will find yourself in the small community of Cochran Mobile Park.

Cochran feels like an improbable place. Laid out on a four-street grid, the *colonia* is arranged in a near-perfect square, like an island surrounded by a sea of desert. Its four main roads are paved, as is Buffalo, the road connecting the community to the highway, but numerous dirt roads crosshatch the landscape to its immediate east, a network of seemingly arbitrary paths that connect nothing to nothing—a scant few abandoned structures, a water tank, a *colonia* called Lakeway far to the northeast, and far to the south another *colonia* known among locals as "La Coyotera," which translates to "a den of coyotes." These roads and tangled desert scrub are cast about in trash: A rusted refrigerator. Truck tires. An upturned sofa. Plastic garbage bags snared in the thorns of acacias and mesquites. Of all Texas colonias, Cochran ranks 13 in terms of need for water services and public health risk (RCAP 2015).

The desert in which Cochran exists receives a mean of 11 inches of rain a year and aridity has seeped into the community's character. Most lots feature modest homes behind fences and walls, situated in semi-barren patches of dirt. When the spring winds blow, desert dust lifts into the sky, powders the houses, and settles on the water tanks and the cisterns that sit in shacks or in the open air alongside the homes. Summer temperatures routinely surpass 100 degrees, an

oppressive heat that drives life indoors. Afternoon streets are thus lazy streets, devoid of movement except for an itinerant dog, a chaparral, a covey of quails, or a grandmother and her grandchildren coming home from the Dollar Store, known among locals as *El Dólar*.

Officially, Cochran is a community of 23 residences. In my fieldwork, I found that several of these have since been abandoned or converted to part-time houses. Life in this *colonia*, as most residents told me, is tough, and much hardship extends from lacking the basic water services common to most households located elsewhere in the developed world. Water problems almost never involve only water. In these homes, which shelter multiple generations of Mexican and Mexican-American families (grandparents, working parents, and grandchildren), water burdens spill over into other life domains, inflecting time, health, stress, and monthly budgets. A 2016 income survey conducted by the County of El Paso revealed that all responding Cochran households were either low income (31%-50% of the median family income) or very low income (30% below median family income). One family of four, for instance, reported an annual income of only $24,000. Another family of 12 reported getting by on an income of $39,800. Water burdens in this context take on added import, as when, for example, a low-income family must buy expensive water that is difficult to obtain. In a classic example of "the poor pay more," water is costlier for Cochran residents than almost all users in the same watershed, and this expensive water takes a bigger bite, proportionally, of Cochran residents' smaller incomes.

These findings and their importance are fleshed out in greater detail under the section titled "Conditions in Cochran and Las Pampas"; for now, it is important to understand an overarching concern that lingers in the minds of many Cochran residents. For decades, families have been aware of a water main that was installed in the nearby *colonia* of Agua Dulce. Located directly to the west of Cochran, Agua Dulce (in English, Sweet Water) is a much larger *colonia*.

More than a decade ago, Agua Dulce was connected to the regional water supply. Consequently, its residents enjoy access to free-flowing, potable water that comes into their homes from an inexpensive, centralized source. In the earliest stages of my fieldwork, Cochran residents expressed a strong desire to be connected to the Agua Dulce waterline, which terminates at a hydrant less than a quarter-mile west of Cochran. Various times in the recent past, but especially in 2016, Cochran residents were led to believe that the local powers that be—the county, the city, the State of Texas, federal agencies, and/or the local utilities—were going to undertake a project that would connect them to water. But these projects invariably fell through, a sequence of false promises and dashed hopes that have led to complex sentiments of abandonment, distrust, resentment, apathy, anger, and, for some, resolve. These findings and their implications are treated in the section under "The struggle for access: Belonging and exclusion in the hydrosocial waterscape".

2.2: Field Site No. 2: Las Pampas

Highway 67 cuts across a classic desert mesa on its way out north to the touristy town of Marfa. A sere brown landscape, populated by creosote, yucca, mesquite, and *huisache*, the mesa tapers out into the alluvial floodplains of the Rio Grande and the Conchos, where the two rivers merge at the sister cities of Presidio, Texas, and Ojinaga, Chihuahua, Mexico, about 250 miles south of El Paso. Along the riverbanks, the corridor is green. Mexican farmers irrigate their land in a patchwork quilt of fertility. But on the mesa—high, dry, and some 10 miles northeast of the border—water remains as remote as the rivers below.

Las Pampas—listed as one of the 25 Texas *colonias* with the severest need in terms of water service and public health (RCAP 2015)—sits atop this mesa. A scattering of 12 residences, three businesses, and a single-strip airport comprise the Las Pampas community, although to call

it a “community” in the proximal sense might be a stretch. Las Pampas homes crop up at random intervals along some 8 miles of highway, with broad desert spaces in between. The structures are either mobile homes or self-built houses parceled together in an incremental fashion. When supplies, time, and money come available, the owners themselves add a new section of roof, an outbuilding, a door, or a room. Potential supplies are kept on-hand, so many yards resemble scrapyards, strewn about with old trucks and auto parts, varieties of appliances, oil drums, plastic tanks, and cords of rotting wood. I saw one home with a roof of corrugated metal weighed down by truck tires. Another featured a coy pond and 3-foot palm trees planted in rows. Two residents built towering tanks to gravity-feed water into their homes. Some residents garden and maintain small orchards. Others practice animal husbandry, keeping sheep, horses, chickens, and goats.

Like Cochran, Las Pampas retains an arid, West-Texas-desert feel, although it gets slightly more precipitation (about 12 inches a year according to the National Oceanic and Atmospheric Administration). But Cochran has ties with the populous cities of El Paso and Juarez. Las Pampas connects with Presidio and Ojinaga, smaller places, and it retains a more rustic feel. Many residents refer to their properties as little ranches (*ranchitos),* their manner of speaking echoes rural *Chihuahuanse* dialects, and they harken back to their youths in small Mexican *ranchos* and *pueblos*. Ties with Ojinaga, Mexico, are strong. Las Pampas residents cross the border frequently, in part because Ojinaga is larger and better-networked than Presidio. Residents often described getting vehicle repairs, groceries, and other supplies on the Mexican side, where such life-necessities can be had for cheaper and in greater supply.

My work in Las Pampas was preceded by a project carried out by the Center for Environmental Resource Management, which had spent several years speaking with residents, holding meetings, conducting health-impact assessment studies, and installing rainwater

harvesting systems. During my time in Las Pampas, I only encountered one household with children. Most residents are elderly (median age 68 years) (Hargrove and Del Rio, 2018), and several hold jobs in Presidio. Las Pampas residents rely almost exclusively on hauling water from Presidio. They pay a flat rate of $20 per month and fill tanks in trailers or pickup trucks at a spigot-like tap in a city park. While the Presidio municipal water is potable, it risks contamination when transferred to residents' tanks. For this reason, most Las Pampas residents pay, on average, about $20 a month for potable water, which comes in bottles or in five-gallon jugs (*garrafones*) from water-vending machines (l*a machinita*) in Presidio. Factoring in the rate for gas to and from town for water trips, which averages $30.81, Las Pampas residents pay a mean of $70.81 to meet their monthly water needs (Hargrove and Del Rio, 2018). I share more on the effects of water insecurity on budgets, time, physical health, and stress in the findings section under "Conditions in Cochran and Las Pampas."

Las Pampas is also like Cochran in that residents are low-income; 89 percent of households take home an annual income of less than $15,000 a year (Hargove and Del Rio 2018). Many residents suffer from chronic health conditions such as asthma, diabetes, hypertension, and others. Such conditions are doubly burdensome and risky, especially for the elderly, who live isolated and removed from larger communities and medical services. Interestingly, however, Las Pampas has developed its own lines of social support, a network of collective social functioning whereby distant neighbors check up on one another, offer rides, and haul water.

Several residents expressed a degree of fatigue with seemingly unending plans and promises that piped water will someday arrive in their community. For more than two decades, according to these residents, a project has been in the pipeline to connect the small airport, which

currently relies on hauled water, to Presidio's water source. Should this project come to fruition, there is a likelihood that parts of Las Pampas could receive connections. As with most water infrastructure projects, however, residents would likely have to pay to connect themselves to the main line's hookups. Moreover, this pipe would only extend to the airport; at least half of the community's neediest residents would be beyond the project's hydraulic reach. Even those who live between the town and the airport, who would likely benefit from such a project, seem dubious about its potentiality. Most want the project to happen, of course; they speak to its potential to ameliorate their lives. But they have become inured to what has been in their experiences an unbroken succession of undelivered promises. "I have 30 years here," explained one resident, "and since I got here, I've heard, 'Now we're going to bring the water.' And this is the word that's there—'now.' 'Now, now, now, we're going bring the water.' The lies they tell you over there, how can one count them all?"

2.3: Methods

The object of this study was to gain insight into how residents in small, remote, and isolated *colonias* think about and cope with the burdens of water insecurity, as well as to understand what factors of the hydrosocial waterscape converge to continually reproduce communities without access to water and sewer services, and finally to gather baseline data on a novel approach to potentially ameliorating household water insecurity, that being the soft path to water. Field sites for the community case studies were selected with those objectives in mind.

Previous research (Hargrove et al. 2017, RCAP 2015, Las Colonias 2015) indicated not all but most *colonias* that remain disconnected from water services today are small, remote, and isolated. These attributes contribute to extreme marginality. In terms of water, they foster conditions wherein water projects are difficult and expensive to implement and carry high costs-

per-connection. Given these observations, I sought case-study field sites in geographically remote *colonias* with fewer than 40 households and without connections to sewer and water. Taking into account health risk and lack of access to water and sanitation services, both Cochran and Las Pampas were listed as among the 25 most vulnerable in *colonias* Texas (RCAP 2015).

From the outset, the priority goal was to understand residents' needs, desires, and capabilities with respect to water services. For this reason, when approaching households, I sought first to get a sense of the degree to which lacking water affected residents' lives. I did not foreground discussions of soft path or other water interventions. Rather, through ethnographic-style observation and open-ended, recorded conversations, I gradually gained insight into the lived experiences of water insecurity. I paid particular attention to the comings and goings of water. How did residents go about gathering water? How did water enter, exit, and flow through the household? How were water sources of varying degrees of quality used? In what ways did water insecurity spill over into other life domains? How much money and time were spent in water gathering? And, importantly, what were residents' aspirations for water and sanitation provision?

2.4: Access and Approach

I first visited Cochran on an initial exploratory drive during which colleagues from UTEP and I made passes through several *colonias* in El Paso County. Cochran was not the only small, remote, and isolated *colonia* in the county—far from it—but it was interesting in that the homes were relatively clustered in a grid, the community appeared to house families (bikes and toys in the yards), and each house had outdoor water tanks and sheds. I later spoke with a county engineer who furnished a list of names and phone numbers of Cochran residents. I called the first name on the list, explained I was working on a project to understand why the community lacked

access to water, and asked if I could pay a visit. The resident, Antonio Flores (all names in this study have been altered to protect identities as stipulated by the Institutional Review Board), was eager to talk.

Immediately following the initial in-person interview, as my colleagues and I prepared to leave Cochran, we saw a young man pulling up to his home. I approached and asked if he would be willing to talk at a later date. We exchanged numbers. This young man was Mario Meléndez, who would turn out to be my primary informant in the Cochran case study. Like Antonio Flores, Mario Meléndez was eager to talk, and both expressed a strong desire to have their homes connected to water. They hoped I could somehow help them make this happen. Mario was especially keen on his neighbors getting involved in a community effort to have their community connected. During our first interview, he offered to come with me as I went door-to-door. In this way, over the course of numerous visits, Mario and I canvassed the Cochran community.

Entrée in Las Pampas was facilitated through colleagues at UTEP's Center for Environmental Resource Management (CERM), which had been engaged in a multi-year project to assess the health impacts of water insecurity in the community. CERM had also helped administer a project in which students from UTEP's Engineers for a Sustainable World club had installed rainwater-harvesting systems on two residents' homes. Initially, my intention was to gather qualitative data on how these systems did or did not fit in with the lifestyles and water budgets of *colonias* residents. Arriving in Las Pampas, however, I was encouraged to expand the study beyond these two households. During repeat visits and phone calls, I sought to understand the various water-borne burdens confronted by residents without service, as well as their coping mechanisms and the underlying causes. Like in Cochran, I also solicited information on

residents' funds of knowledge and perceptions with respect to the potential efficacy and desirability of technologies and practices exemplifying the soft path to water.

2.5: Interviewing, Sampling and Survey Methodologies

The overall study period totaled 8 months (February-September of 2019). Going door-to-door, I conducted 11 semi-structured interviews in Cochran, accounting for nearly half of the 23 homes in the community. However, although the State of Texas officially counts 23 residences in Cochran, I noted that many have since been abandoned or converted into part-time homes. Residents explained that several neighbors moved away because of the costs and difficulties associated with meeting household-water needs. On repeat visits, I conducted follow-up interviews and surveys in 8 households. Three residents could not be reached for follow-up interviews despite numerous visits and phone calls. Of the 8 residents contacted for follow-up interviews and surveys, two declined to take the soft-path survey (this survey instrument is explained below and displayed in the appendix), one woman kindly stating that she simply did not want to take it, the other resident saying he was not interested in alternative technologies and practices; his only desire respecting water was to be connected to the nearby waterline. Of the 11 residents initially interviewed, two became key informants (Mario Meléndez and Margarita Hernández), people with whom I spoke regularly over the phone or in-person to learn about the neighborhood, its history, and the struggle to obtain public water. I also engaged with these two residents, especially Mario Meléndez, in an effort to rally the community to demand water access through phone calls, letters, and meetings with state and local water-project decision makers. This latter part of the project developed along the lines of a community-based, participatory-action research project. The appendix of this thesis contains reports, fact sheets, and letters

written on behalf of Cochran residents as part of my engaged effort to connect the community to water.

In Las Pampas, I interviewed 11 residents and conducted repeat visits with three residents. Surveys and initial interviews were conducted back-to-back in my initial visits. I conducted both at once to take advantage of my time during trips to the community, which was far from where I live.

I also conducted 6 semi-structured interviews with people I termed "decision-makers," which denotes county and state representatives, environmental agency heads and staff, a city engineer, and representatives from a local water utility. These interviews were part of the effort to puzzle together the wider set of influences in the hydrosocial waterscape—agencies, utilities, and politicians who might try to connect communities to water, but in the case of Cochran and Las Pampas have, to date, been unable to do so.

Combining these three sets—Cochran, Las Pampas, and decision-makers—I conducted 28 semi-structured interviews (N = 28). Of the 28 semi-structured interviews, 22 were with *colonias* residents and 6 were with decision-makers. The interviews lasted anywhere between 30 minutes and 2 hours and were digitally recorded, transcribed, translated, and coded for themes using NVivo12 qualitative software.

I also administered 17 soft-path surveys to *colonias* residents (N = 17), 6 in Cochran and 11 in Las Pampas. These surveys were semi-structured and carried out in a manner to generate conversation. The survey instrument included 20 questions on hard-path and soft-path technologies and practices, including conventional water infrastructure and sewerage, rainwater harvesting, low-flush toilets, composting toilets, micro-sewage-treatment-and-reuse plants, as well as water-saving practices, like 2-minute showers, greywater reuse, storm water capture and

reuse, and putting rocks in toilet tanks to displace water and conserve when flushing (the full survey is available for viewing in the appendix). The survey technologies and practices were derived in part by consulting "The Soft Path to Water Guide" (Holguin 2019) developed at CERM, in part by considering which practices might work best in *colonias* contexts, and in part by ensuring the technologies and practices fit with the four following soft-path principles:

1) decreasing demand for water through conservation measures and reduced-use technologies,

2) increasing water supplies through improved use of local sources, such as rainwater harvesting,

3) improving quality of water through point of use treatment technologies, and

4) increasing water supplies through decentralized waste treatment and reuse.

Beyond an instrument to collect "yes-or-no" answers to the perceived efficacy and desirability of various hard-path and soft-path strategies and technologies, the questionnaire became a catalyst for longer, more in-depth conversations about ongoing coping strategies, water burdens and budgets, water conservation, and residents' perceptions and attitudes toward decentralized water strategies in articulation with more conventional infrastructure. In survey sessions, open-ended interviews, and participant observation, I paid close attention to residents' funds of knowledge as they pertained to water use, water gathering, and soft-path strategies, noting in the field and in the analysis of field notes where residents lacked and/or possessed funds of knowledge.

The survey questions were administered in personal conversation and accompanied by a binder full of photos and diagrams that helped explain the technology or practice in question. When asking a question, for example, about low-volume showerheads, I showed residents a

photo of the showerheads and explained how much water it could potentially save. These photographs and diagrams were invaluable in getting across the thinking and reasoning behind the strategies and technologies under consideration. Residents were asked if they already used the technology or practice in question, and, if so, what they thought about it. If they did not use it, I asked whether they were interested in it and why or why not. Residents also had the option of determining that the technology or practice "doesn't apply" in their given situation. In asking these questions, I tried not to persuade residents one way or the other. I simply presented the practice or technology, the thinking behind it, and tried—to the best of my limited ability—to answer residents' questions.

A limitation of the survey was that I did not ask residents whether they would be willing to pay for the technology in question. Doing so would have likely swayed fewer residents to declare that they were interested in the devices. However, it is not this study's argument that residents should pay for soft-path technologies. As a matter of environmental justice, I argue that the state has a responsibility to lift its residents out of water-insecurity. The soft path to water could offer an intermediary step in achieving this goal. For that reason, the information elicited by the survey was by design bounded at determining whether residents thought such technologies were potentially useful, desirable, and applicable. This line of questioning allowed me to gather quantifiable data as to what technologies and practices were already in use and what technologies and practices were or were not of interest. Additionally, these questions led to the recording of rich ethnographic-type data generated in the open-ended conversations that followed each question.

2.6: Philosophical methodological considerations: Ethnographic fieldwork on multiple fronts

In the course of this research, I wore multiple hats, sometimes simultaneously. On one level, I wore the hat of a curious researcher, someone entering the field to gather data on what it is like to live in a marginalized community without access to water. On another level, I wore the hat of a development researcher, gathering information that could lead to practical implementation of a set of tools and methods that might help alleviate water burdens. On a third level, I investigated the (dis)connections and breakdowns in a sociopolitical and economic system that continuously reproduces "no-win waterscapes" (Jepson, 2014) and discursively permits vast disparities in access to water. And on yet another level, I wore the hat of a participant-observer, an engaged researcher who worked alongside *colonias* residents trying to influence the hydrosocial waterscape such that it would take their needs, desires, and claims seriously, with the ultimate goal, in Cochran, of connecting the community to water.

Although we have to-date been unsuccessful in establishing that connection, this method of conducting ethnographic fieldwork on multiple fronts allowed me to survey the problems intersecting with water insecurity at different scales, illuminating a relational and holistic portrait of water insecurity in intimate, ethnographic detail and broader context. Attending to fieldwork on multiple fronts, I was able to bridge ethical divides. In solidarity with residents, I channeled my position as a researcher toward advocacy, publishing reports and fact sheets, relaying information from residents to decision-makers and vice versa, scheduling meetings, and writing template letters—all of which were aimed at helping Cochran residents achieve their ultimate goal of connection. These efforts serendipitously helped me to make sense of the various discursive and bureaucratic entanglements that keep *colonias* like Cochran and Las Pampas in states of water insecurity, information which feeds arguments presented below on the structures and conditions that produce water insecurity in marginalized U.S.-Mexico border communities.

These arguments contribute to the theoretical understanding of the hydrosocial waterscape's underlying conditions and assumptions, the complex web of institutions, infrastructure, laws, and funding mechanisms that, directly or indirectly, discursively permit no-win waterscapes to persist. Changes to these social inequities would ultimately be ideal, for it is indeed a skewed political ecology that provides justification for more than 100,000 U.S. border residents to live in water insecurity on the basis of "insufficient resources" or "sound fiscal policy." How could such a state of affairs persist when the U.S. is among the wealthiest nations at a point in world history coinciding with the vastest-ever accumulation of wealth? And yet, for decades, and despite years of struggle, these underlying structures remain in strength. At this point, then, and given the situation's exigencies, it becomes the engaged researcher's prerogative not to forego, trivialize, or minimize critiques aimed at the structure's roots—which, I argue, along with numerous others, are planted firmly in the soil of neoliberalism—but to also seek pragmatic alternatives that could ameliorate urgent situations observed in the field in the here and now.

This study's methodologies were guided by a notion advanced by Amartya Sen (1999), that the end-goal of development is freedom of capabilities. In pursuit of those freedoms, a researcher need not imagine that technological interventions, critiques of the system, and/or praxis are mutually exclusive. Sen himself embraces a range of ideas and interventions, ranging from putting power (and funds) in the hands of women, to fostering more political influence among vulnerable populations, to carefully considered, small-scale technological interventions. Paul Farmer terms this approach "pragmatic solidarity;" in deed, as a doctor, Farmer treats the infirm who come before him; in word, as ethnographer, he eloquently lashes the structures of inequity which are, at bottom, propped on a misplaced notion that there is "differential value of

human life" (Farmer 2000). In a modest way, this study's method of fieldwork on multiple fronts attempts to do the same.

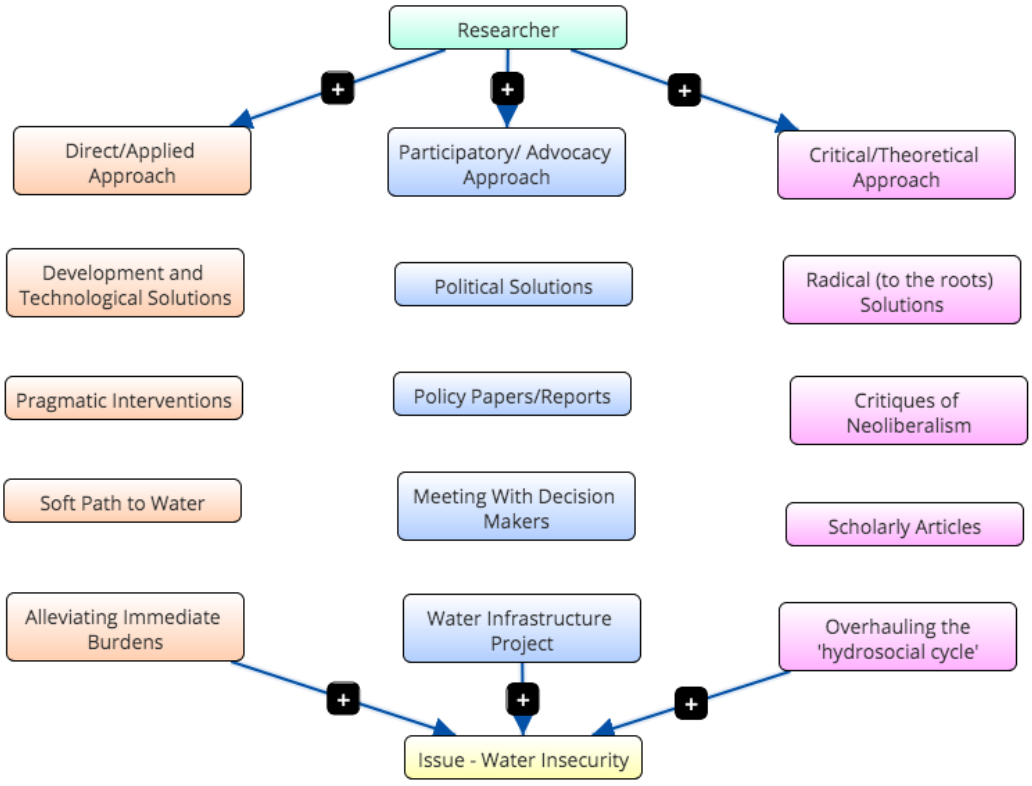

Figure 2: Ethnographic fieldwork on multiple fronts

2.7 Results Roadmap

To begin the presentation of results, I start with findings derived from a title search on Cochran Mobile Park. These results offer a grounded case for the historical emergence of an El Paso County *colonia*. Cochran's development illustrates many of the themes laid out by Ward (1999). It thus offers a microcosm of the wider "*colonias* phenomenon," and demonstrates that *colonias* are not randomly occurring, but arose out of a social and legal landscape that provided for developers to take advantage of low-income, working-class residents.

The next major section details the day-to-day realities of living in conditions of water insecurity, which were unearthed in the course of repeat visits, interviews, soft-path surveys, and

ethnographic observations. This section is titled "Part 2: Conditions in Cochran and Las Pampas," and it is organized into three thematic subsections: household water economics, hardships in meeting basic water needs, and keeping families in water-precarious situations. These subsections begin with ethnographic portraits. Each portrait is meant to highlight and offer thick description on key points made more generally in the presentation of findings to follow. Through the use of ethnographic portraiture, I examine the lived experiences of *colonias* residents as they negotiate water insecurity on a day-to-day basis. These "thick descriptions" (Geertz 1973) allow us to zoom in on human agency, creativity, and resilience in dealing with water-borne hardships.

With this methodology, I follow in the footsteps of the work of Nunez-Mchiri et al. (2017), who depicted portraits of women in *colonias* dealing with food insecurity. Portraiture, according to these authors, joins social science, art, and the humanities to go beyond "simple statistics on poverty." The goal in presenting this evidence, then, is to capture the "richness" and "multidimensionality" of water insecurity as experienced and dealt with by *colonias* residents. At the end of each portrait, I tie the ethnographic narrative into the larger presentation of results to follow through with a description of an ethnographic lesson. At the end of this section, my hope is that readers will have a good sense of the particular water-related hardships experienced by residents at both field sites, including the environmental and economic injustices, residents' coping strategies, and the struggles they confront on a daily, ongoing basis.

Establishing these water-related hardships, we proceed into the next major results section, an evaluation of the hydroscial waterscape. More specifically, this section—titled, "Part 3: The struggle for access: Belonging and exclusion in the hydrosocial waterscape"—focuses on the role of discourse in excluding Cochran Mobile Park from water access. I explore disconnects between

residents' needs, desires, and expectations, on the one hand, and the rationales offered by decision-makers in the wider hydrosocial waterscape on the other. These rationales are used to explain why it is difficult, if not impossible, to connect Cochran to conventional infrastructure. However, the residents themselves generally find such reasoning suspect, unreasonable, and unfair. Like in the "conditions" section outlined above, these results begin with an ethnographic portrait. In this case, I tell the story of Mario Meléndez, who has taken up the multi-generational struggle to motivate actors in the hydrosocial waterscape to connect his community to water. After Mario's perspective, we then "zoom out" to trace the discourse at three different levels: the Cochran community, the localized region, and the state and federal. In the end, these discourses demonstrate how water insecurity as experienced in Cochran is re-produced at multiple scales and embedded within a larger neoliberal hegemony.

The final major results section—titled "Part 4: Toward the soft path: diffusion of innovation, funds of knowledge, and soft path synergies for human capabilities"—centers on the soft path to water as a means for freeing up human capabilities in water-insecure *colonias*. Results in this section were generated from ethnographic observation, informal interviews, and soft-path questionnaires. I begin with an overview of the survey results, then move into qualitative analysis of soft path strategies as they articulate with funds of knowledge. This includes a lengthy ethnographic portrait of Suzette Shapiro and her son Sammy, Las Pampas residents, who demonstrate funds of knowledge as they intersect with the soft path and human capabilities theory.

CHAPTER 3: RESULTS

3.1: Tracing the Chain of Title - Cochran's Emergence

As improbable a place as Cochran might seem, it has a history, an underlying logic, and a set of circumstances and decisions that explain how it came into being. I unpacked this history by talking to Cochran residents and running chain-of-title searches on individual Cochran properties. Starting with a set of addresses, I was able to peer back into history, to see who sold which lots to whom, and to disentangle how the large tract of land was bought, parceled, and sold—without basic services like water and sewer—for more than twice its original purchase price.

In 1978, William B. Cochran and Margaret S. Cochran bought the raw land, about 60 acres, with a $20,000 note from First National Bank of Doña Ana County (see "Cochran Chain of Title" in Appendix). Two years later, the Cochrans filed subdivision restrictions on the same section of land, a necessary step for making the land commercially available (see "Cochran Chain of Title" in Appendix). A large section of the 60 acres was divided into 72 lots; these became the Cochran Mobile Park development.

In May 1991, the Cochrans sold 61 lots to Jesus Parral for $40,000, double the amount for which the raw land was purchased (see Cochran Chain of Title in Appendix). Jesus Parral and Roberto Parral (names altered for privacy) then began to sell off individual lots. I found several instances where the Parrals sold individual lots to current owners. Another LLC, Tierra Developers, also acquired and sold off individual parcels, though the title searches did not make clear whether Tierra Developers bought lots from the the Parrals or the Cochrans. In any case, both Tierra Developers and the Parrals have sold lots to most of the individual owners who still own title to the land today. In summary, then, the Cochrans bought the raw land, subdivided it,

and sold a batch of unimproved parcels to the Parrals. From that point, the Parrals and Tierra Developers began selling individual lots, and, in some cases, individual lot owners sold their lots, and the original property was thus fragmented down the chain of title (see Cochran Chain of Title in Appendix).

Cochran's deed histories illustrate a widespread phenomenon in the state of Texas: Developers purchased large tracts of land, subdivided them, and sold them for profit without providing basic infrastructure, a practice that has historically been prohibited within city boundaries. In order for a developer to subdivide and sell land for residences in city boundaries, he or she has legally been obliged to provide hookups for basic services, like water, paved roads, sewerage, curbs, drainage, and electricity infrastructure (Ward 1999). In the rural and peri-urban areas that characterize most *colonias* geographies, developers, such as the Cochrans, legally sidestepped such platting regulations, a practice that contributed greatly to the proliferation of low-income communities living in water-insecure circumstances.

Around the time that Cochran was formed, land for low-income housing offered a ripe market for developers to exploit. As Ward plainly states, "Few Mexicans or first-generation Mexican-Americans working on the Texas border earn enough to afford housing at market rents or qualify for traditional home financing" (Ward 1999). Ward first published his influential book on borderland *colonias* around the time that many of the Cochran families with whom I spoke were searching for affordable housing. At that time, Ward observed that "many of these workers earned as little as between $5,000 and $10,000 a year." In this context, it is clear to see why residents would find Cochran suitable. Subsidized housing offered inadequate relief, public housing was all but nonexistent, and for Mexican and Mexican-Americans employed in the general-labor economy, incapable of affording rent in nearby Horizon City or El Paso, and

unable to qualify for traditional financing, cheap lots in the desert beyond city outskirts presented themselves as the only passable options.

During the 1980s-90s period of rapid urbanization, developers seized on the newly created consumer demand for cheap land, which arose alongside other advantages, including a vast supply of open land, minimal rural development regulations, and the Contract for Deed mechanism discussed in the literature review above (Ward 1999). These developers' early practices set roots for the legacy of *colonias,* a legacy that includes racial marginalization and an array of environmental and economic injustices. As society has scrambled for decades to accommodate the tens of thousands of *colonias* households that lack basic services, hefty price tags have ensued. From 1989 through 2015, the Texas Economically Distressed Areas Program program alone has raised $500 million in statewide bonds to fund water and wastewater projects in *colonias* (Texas Water Development Board 2016). Almost exclusively, taxpayers paid the bills for these infrastructure projects. Meanwhile, the developers, with whom the problems originated, walked away with the profits.

With the title history of Cochran now situated in the wider context of the development of *colonias*, we can now turn our attention to the conditions of household water-insecurity observed in both Cochran and Las Pampas. I grouped water-insecurity around three primary themes, or findings: household water economics, hardships beyond economics in meeting basic water needs, and keeping residents in water-precarious states.

3.2: Conditions in Cochran and Las Pampas

3.2.1: Finding No. 1: Household Water Economics

Filomena Martinez lived in a pastel-orange home with her husband, children, and parents-in-law. Altogether, eight people lived in the modest home, built by her husband's parents

more than 20 years ago. When I spoke with Señora Martinez, she sat her two young children in front of the television. They watched cartoons as she related to me the troubles her family had been experiencing with meeting their basic water needs.

First, she explained that the cost of water kept increasing. “Six months ago, they started charging $70,” Señora Martinez explained. “Now, they’ve started charging $75. I think it’s because we’re really far away, you know, but I’m not sure.”

The “they” Señora Martinez referred to was the water-hauling company. Like many Cochran families, the Martinez household relied on a private company to deliver water (la pipa). In recent months, the company had begun to charge more. A few years ago, several residents reported paying as little as $40. Then, the price rose to $60. At one time, Señora Martinez explained, two water-hauling companies were competing for their business. When the second company shut down, the remaining company was left with a monopoly. For most residents, water prices shot up to $70 before quickly rising again to $75.

Señora Martinez explained that her family typically needed about 2.5 deliveries a month. At $75 per delivery, that came out to about $187.50. However, the water delivered by the trucking company was of suspect quality. “It looks fine,”Señora Martinez explained, “but we don’t have trust in it, because of the fact that it comes transported and we really don’t know how it is in the trucks. So, we don’t drink this water.”

Each of the 11 households I visited divided their water consumption in this way. Hauled water was set aside for washing dishes, taking showers, watering plants and pets, and washing clothes. Drinking water was bought for an additional price. In the case of Señora Martinez, she estimated an additional $40/month spent on bottled water. That brought the family’s total monthly water expenditures to $217. For this amount, the family used surprisingly little water—

an estimated 6,450 gallons/month. Nevertheless, the Martinez family spent more on water for their monthly needs than any other family interviewed for this study—and still the water was unreliable.

"Sometimes, you call (the water trucking company) and they don't answer," she said. "Then, we're without water for two or three days. We have to go to other family members to borrow water. During this time, we can't bathe, we can't clean anything."

Mrs. Martinez's struggles with expensive, unreliable water coincided at a nexus of environmental and economic injustice. This water-insecurity nexus made it so low-income residents of Cochran paid far more for their monthly water supply than average El Paso and Horizon City households, even though Cochran residents used far less water than average El Pasoans, and were made to contend with an unreliable supply of inferior-quality water.

The majority of households interviewed—8 of 11—reported obtaining their water by purchasing it from a water-trucking company, which hauled water to their homes and deposited it in tanks in their yards. Of the remaining households, two relied exclusively on hauling their own water, and one used a combination of both paid-hauling and self-hauling. Those who hauled their own water collected it by driving to friends' and/or family members' houses in nearby neighborhoods, filling tanks with garden hoses, and hauling water back to their homes. Every household interviewed reported that they did not drink hauled water, but rather used it for other water-related purposes, such as washing dishes and clothes, showering, flushing toilets, and watering plants and domestic animals. Residents reported not drinking the hauled water for fear that it had been contaminated either in the process of hauling or storage in difficult-to-clean tanks outside their homes. On the one hand, this meant Cochran residents did not report any illnesses related to water consumption. On the other, Cochran residents paid an additional price

for water of potable quality, which came in the form of bottled water and/or five-gallon water jugs.

Obtaining household water through hauling and purchasing bottles and jugs (*garrafones*) proved extremely expensive (Table 2). Based on information obtained in 11 household interviews, the average Cochran household paid an estimated $122.13 a month for water. Of the 9 households interviewed that paid a water-trucking company for hauled water, 7 were families of 3 or more people. These families reported receiving one or more loads of water per month, whereas the two remaining households, which consisted of one and two household members respectively, received water far less frequently—in both cases, one load every three months. The estimated average monthly cost of water for the 7 Cochran families who purchased hauled water on a regular, monthly basis—which includes hauled, non-potable water and bottled water for drinking—was $156.28.

Table 2: Estimated Cochran household water consumption and costs

Household	Number in Home	Hauling Method	Hauls/ Month	Cost Per Haul	Potable Water Costs	Water Usage/ Month (gal)	Total Water Costs/ Month
Home 1	4	Paid	2	$75	$20	5,100	$170
Home 2	6	Self	12	Gas: $1.10	$32	3,460	$45.20
Home 3	6	Paid	1	$65	$30	2,756	$95
Home 4	?	Paid	2	$75	?	5,000	$150
Home 5	1	Both	1 every 3 months	$50	$25	955	$41.60
Home 6	2	Paid	1 every 3 months	$75	$20	930	$45
Home 7	8	Paid	2.5	$75	$40	6,450	$217
Home 8	3	Paid	1	$70	$30	2,650	$100

Home 9	5	Paid	2	$75	$32	5,160	$182
Home 10	3	Paid	2	$75	$30	5,150	$180
Home 11	12	Self	16	Gas: $1:10	$100	4,900	$117.60

At $156 per month, the average Cochran family relying on *la pipa* paid much more for water than the average El Paso household, which paid $57.95 per month (Kolenc, El Paso Times, 2018). One Cochran family (that of Mrs. Martinez) reported a monthly water bill of $217 per month, nearly four times the average El Paso water bill. The economic disparity in water bills was even more pronounced in comparison to Horizon Regional Mutual Utility District (hereafter Horizon MUD) water rates. A household served by Horizon MUD that consumed in the range of 3,000-6,000 gallons per month (the range consumed by all Cochran households surveyed) would pay $12.58 per month, plus a one-time hookup fee of about $70. That meant the average Cochran household paid roughly *23 times more* for their monthly water than a similar water user would pay in the nearby Horizon MUD utility district. It is worth remembering that this is the utility district that residents have attempted to become a part of. Horizon MUD currently has a water line and hydrant within .25 miles of Cochran Mobile Park.

Whereas customers served by the El Paso Water Utility received water of potable quality, low-income Cochran residents paid more for water of inferior quality. Moreover, Cochran residents used far less water than average El Paso households. The 11 Cochran households in consideration used an average of 3,865 gallons per month. According to the Texas Water Development Board, per-capita residential use in El Paso was 86 gallons per person per day (gppd) (Texas Water Development Board, Table 3). This figure focuses strictly on residential use, leaving out non-residential consumption. Including all water uses, including commercial, agricultural, and the like, the El Paso per-capita water consumption is 128 gpcd (EPWU, Table

4). Based on the TWDB figure—in other words, leaving out non-residential uses—an average household of four in El Paso used 10,664 gallons per month. Thus, the extent of the economic injustice related to water bills in Cochran could be summed up as follows: Compared to an average household of four in the El Paso Water Utility service area, Cochran families, on average, paid 2.6 times more for water of inferior quality, and, for that amount, received less than one-third of the supply (Table 4).

Table 3: Residential water use in Texas cities, gallons per capita daily. Source: From the 2016 Region C Water Plan, Water Conservation and Reuse Recommendations,

City	Municipal 5-Year Trailing Averages (gpcd)			Residential 5-Year Trailing Average (gpcd)
	2001	2006	2011	2011
Amarillo	185	227	185	106
Austin[e]	161	175	155	95
Beaumont[f]	212	209	208	128
Brownsville[d,e]	207	201	135	69
Corpus Christi[a]	181	158	169	78
DWU (Dallas)[f]	261	238	203	95
El Paso[b,c,e]	172	164	139	86
Fort Worth[c]	203	191	165	81
Houston[b,e]	155	160	143	69
Laredo[a,e]	185	175	147	85
Lubbock	185	180	140	97
San Antonio (SAWS)	144	145	140	86

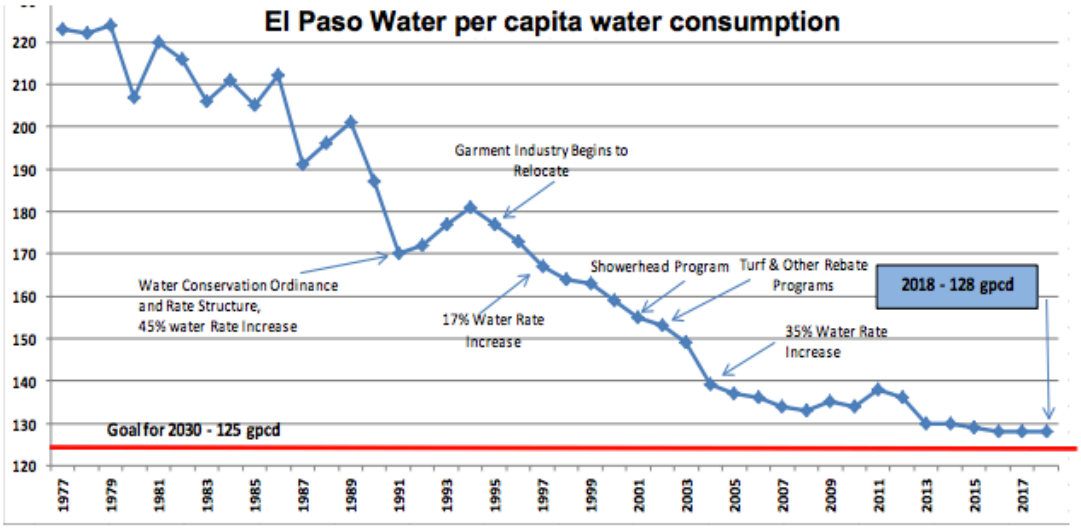

Figure 3. El Paso water per capita water consumption (Source: El Paso Water Utility)

Table 4: Average water costs and usage, El Paso Water Utility households vs. Cochran Mobile Park households

	Cochran Mobile Park	El Paso Water Utility Household
Average Monthly Cost	$122.13	$57.95*
Average Monthly Usage	3,864 gallons	10,664 gallons**

*Source: El Paso Times, Kolenc, Jan. 10, 2018

**The average monthly usage for El Paso households assumed a household size of 4 residents and is based on the gallons per capita daily stastic provided by the TXWDB (see Table 3)

Las Pampas compared to Presidio

Similar economic comparisons could be drawn between Las Pampas and Presidio. Las Pampas residents were mostly elderly and retired, with a median age of 68. Most lived on a very low fixed income (89% of households with an annual income of less than $15,000/yr), and many suffered from chronic health conditions, such as hypertension, diabetes, and asthma (Hargrove et al., 2017). Costs to obtain water for Las Pampas residents were cheaper than in Cochran, but still significant. Residents obtained most of their water by self-hauling from a park in the town of Presidio, which provided a tap that was accessible for a flat rate of $20/month. Nine of the 11 households I visited did not drink the hauled water, citing fear of contamination during hauling or storage in their own hard-to-clean tanks. For that reason, most households resorted to drinking bottled water and water from 5-gallon *garrafones*, which were purchased in water-vending machines located in Presidio. In their analysis, Hargrove et al. (2017) estimated a total direct cost of $40/month for both potable and hauled water. Indirect costs accrued from the relatively distant trips made to Presidio to gather water. Based on the state mileage reimbursement rate in Texas, $0.51/mile, Hargrove et al. (2017) estimated an added indirect gasoline cost of $30.81/month. In total, Las Pampas residents spent about $70.81/month for water. For residents earning $15,000 a year, these high-water costs made up a significant percentage of their yearly income. By

comparison, the average Presidio water bill in 2012 was $17/month (Hargrove et al., 2017). The difference underscores the economic and environmental injustice experienced by low-income Las Pampas residents, who pay, on average and accounting for indirect costs, 76 percent more for water than residents in the nearest town.

3.2.2: Finding No. 2: Hardships in meeting basic water needs

Figure 5: Las Pampas resident Irma Gonzalez stored her water in a row of barrels in front of her home. When Señora Gonzalez needed water, she drew it from these barrels with buckets and pitchers and carried it to her sink, toilet, shower, kitchen, and bathroom.

Irma Gonzalez was over 80 years old, and she lived alone in a small gray home near a desert highway leading out of Presidio, Texas. “My husband and I built (this house) however we could,” she told me during our interview. When her husband was alive, they grew peach trees in their front yard. “We watered all of them,” she explained. “We had a trailer and hauled water and watered all the plants. I was much younger then. And my husband was with me. And we had all these trees. But now they’re gone; I can’t get the water.”

A few years after her husband passed away, a stray dog arrived out of the desert. Señora Gonzalez did not let him in, but she gave him food and water. The dog stayed one night, then another. She named him Suertudo, or Lucky. During our visit, Señora Gonzalez played loud Spanish-language music on an old boombox. She told me the songs reminded her of the days

when her husband was alive and they would go dancing at the Palomino. But the Palomino had closed and those days were gone. “Most of my friends and family have died by now,” Señora Gonzalez explained. “I’m the only one from my family still here.”

A group of blue and gray barrels were lined on a concrete porch beside Señora Gonzalez’s front door. These barrels were periodically filled with water by Frederico Gutierrez, who owned a ranchito nearby. Señor Gutierrez was younger than many people in Las Pampas. He understood the other residents’ needs, especially the elderly like Señora Gonzalez. He often checked in on them. He delivered water and offered rides. He made small repairs around their homes.

The barrels in front of Señora Gonzalez’s home were filled with water hauled from Presidio and covered with warped slats of plywood. Peering inside one of the barrels, I noticed several drowned bugs. In her home, which consisted of a bedroom, kitchen, bathroom, and dining area, she had placed numerous bowls, bottles, buckets, and pitchers. She filled these with water from the barrels outside her home and used them for basic water purposes, like washing dishes, bathing, and cleaning. She did not drink the hauled water, but purchased bottled water and Cokes instead. She had a shower, toilet, and sinks, but no running water. Half-filled buckets and pitchers of cold water surrounded her shower, which she used for occasional bathing. “I can’t use the shower here,” she told me during our interview. “There’s not enough water. I fill a bucket with water (to shower). I have to do this carefully. I’m old, and I have a lot of accidents. I’ve suffered many accidents.” To flush her toilet, she poured water from a pitcher. Her shower, toilet, and sink used to be pressurized with water pumped from tanks outside her home until someone came when she was staying with a friend in Presidio and stole the tanks and pump. “I

battle a lot with the water," she told me. "It's very hard. I live so far out here. It's 10 miles from here to there (Presidio), and I have to get help to fill the barrels."

Experiences of water insecurity are most often described in terms of health and economics. But the case of Señora Gonzalez exemplified negative impacts of water insecurity manifesting in an array of quotidian burdens. Not only did she pay high prices for her monthly water needs, and not only did she use water of suspect quality for daily household chores, but she went through considerable effort in terms of time, mental, and physical stress to obtain water, to worry about water, and to direct water to where she needed it. Bucketing water from barrels, carrying water in pitchers, pales, and jugs around her home, dumping water into her toilet to flush, lifting water overhead to shower, and even losing access to her pressurized water supply as a result of thievery—all of these daily actions epitomized the broad range of quotidian burdens that can be brought about by water insecurity. Señora Gonzalez's situation was thus illustrative of the myriad hardships residents without clean-water access faced in order to meet basic water needs.

During interviews, residents in Las Pampas and Cochran enumerated a range of water-borne burdens that complicated definitions of water security, underscoring how hardships extend beyond economics and health. Considering both communities together, 20 out of 22 residents interviewed expressed some degree of frustration with the fact that they lived in a community—many for as long as 20 or 30 years—without access to water services. I counted 84 instances when residents mentioned a burden associated with water in one of four thematic areas: economic burdens (37), physical burdens (13), mental stress burdens (14), and time burdens (20). I also inquired about the health impacts of hauled water; all residents in Cochran stated that their water did not make them sick because they did not drink hauled water; effectively, their health

risks were transferred to economic burdens. In Las Pampas, two residents reported drinking the hauled water without negative health impacts. One resident, Edna Salas, reported that she drank hauled water in the past, but switched to bottled water as a result of stomach problems: “We don’t drink the water (anymore),” she explained. “It hurts our stomachs if we do. It gives us diarrhea. But the food, when you boil it, we can use it for the food.”

Generally, the hardships expressed during interviews included:

- Concern that children were growing up without access to piped-water infrastructure;
- Concern that the price of trucked water keeps rising;
- Large amounts of time spent gathering water;
- Stress arising from fear that water tanks would run dry;
- Physical hardships related to elderly residents hauling, ladling, and transporting water;
- Difficulties in maintaining pumps and keeping outdoor tanks clean;
- Frustration that lack of water service had left the area in a state of semi-abandonment, so much so that residents from surrounding areas frequently dumped trash and dead animals there;
- Disappointment that landscaping, such as trees and gardens, could not survive in the area for lack of water;
- Lack of trust in the water-hauling company, which residents said frequently filled their tanks with less than the 2,500-gallons for which they pay.
- In Las Pampas, difficulties driving rough dirt roads with heavy water tanks;
- Concerns over the rising costs of water and how those costs might impact ability to pay for other necessities, such as food.

Of particular concern to residents were matters of time and physical and mental stress. Regarding the amount of time devoted to meeting basic water needs, two of the 11 households interviewed in Cochran, and all of the 11 Las Pampas households, relied solely on hauling their own water. In Las Pampas, residents reported making between two and six trips each week to haul water from Presidio. These trips were described as repetitive, lengthy, and labor-intensive, especially for elderly residents. For most, hauling water meant a drive of up to ten miles, hooking up the tap, waiting for their tanks to fill, making the return drive, and pumping water into their at-home deposits. Each trip could take more than two hours. So it was that the ongoing process of getting water structured weekly and daily schedules.

Las Pampas resident Edna Salas, 86 years old, described the time and stress of gathering water as a "*pesadilla*," a nightmare. Señora Salas moved about her home with the help of a walker. Still, she hauled her own water. She reported taking up to six trips per week. She drove eight miles one way. Arriving at the Presidio tap, if she did not have the help of a friend, she climbed up on her truck and inserted the hose into her water-hauling barrels. "When we go, we take two casks (*barricas*)," Señora Salas explained. "Friends who go with me there, they sometimes help me fill the tanks. They put the pump and fill the tank. Whenever we go, we fill those *barricas*. But the pump we used in the city quit working. We had to climb the tank to put the water. Three times a week we go to get water. It's very hard and difficult to do this. In one day, I'll do two trips. And I do that three times a week."

Cochran residents also expressed concerns with the amount of time set aside for gathering water. Margarita Hernández was a grandmother in a household of 12 that relied exclusively on hauling water. To hear her say it, making the trip to get water was an unpopular, if essential, chore:

> And then you're in the summertime, and nobody wants to go, because it's too hot. It takes, sometimes, 45 minutes to put the water in. And then you come over here and put the pump so they can put it into the big can (the tank outsider her home). With the pump, it only takes 10 minutes. But filling up takes longer. Nobody wants to go over there and wait there with nothing to do in the sun. I always say, 'I can go and do *one* load,' but I'm more needed over here, because I have to do all sorts of stuff. I cook, I clean, I watch the kids.

Each week, Mrs. Hernández said, 16 trips were made by various members of her family to a nearby shop owned by an extended family member, where a 275-gallon tote was filled with water drawn from a garden hose. This tote sat in the bed of a beat-up 1994 Ford Ranger, a pickup whose shocks were depressed and whose transmission scraped and grinded and jolted. Whenever the Ranger broke down, times got hard; Senora Hernández always stressed about the Ranger breaking down. In the event of a breakdown, the family would resort to paying exorbitant prices for water. The local water-trucking company (*la pipa*) charged $75 per load, and her household required three loads per month. As it was, with a working truck, the family paid as much as $100 a month. That was because the hauled water was not potable, so the family bought pricier bottled water and 5-gallon jugs for cooking and drinking. What they saved in hauling-money, they paid for in hauling-time. Filling the 275-gallon tote with the garden hose took about 45 minutes. Add to that the drive time and the time it took to pump the water from the tote to the tank, and each trip took about 1.5 hours. At 16 trips per week, the Hernández family typically devoted as many as *24 hours a week* to obtaining water to meet their basic needs. To cope, Señora Hernández explained that her family carefully budgeted time for getting water: "During the weekend, we basically take two days bringing 4 or 5 loads of water (as many as 7 hours). Especially on the

weekend. During the week, we have to get the kids ready for school, and they have to take a shower, and we have to do laundry."

In the cases of both señoras Salas and Hernández, water burdens translated into labor that impinged on time and contributed to stress. In turn, both time burdens and water burdens, or time burdens resulting from water burdens, were in a dialectical relationship with other burdens, such as stress and household economics. Mrs. Hernández, for instance, explained that the family resorted to hauling their own water simply because paying *la pipa* was far too expensive. Accordingly, one of her main concerns was the water-hauling truck breaking down. In effect, the truck was a precarious tool standing between her family and egregiously expensive water. This nexus of water, labor, stress, and economics was echoed in the sentiments of one of Mrs. Hernández's neighbors, Rebecca Ramírez, whose family also hauled their own water. Señora Melendez explained that three times a week someone from her family traveled to a nearby neighborhood to haul water. She said this task was despised among her family members, especially in the wintertime, when it was cold and windy and the water often sprayed or splashed onto their clothes. When I asked her why her family did it, why did they haul their own water, she responded with a smile and a shrug: "Because we're poor."

3.2.3: Finding No. 3: Keeping families in precarious water situations

"Nos estan robando con esto!"

"They're robbing us with this!" exclaimed Juan García, a father who lived in a mobile home next door to Señora Melendez. "They tell us it's 2,500 gallons. It's not the truth. The truth is 2,200 gallons." A typically calm man, Señor García was clearly distressed by being left to the mercy of la pipa, a private company that contracted truck drivers who seemed to show up willy-nilly, who charged a lot of money for water that his family could not drink, and who consistently

deposited less water than the 2,500 for which he supposedly paid. Señor García knew this was true, because, as he said: “My tank is 2,700 gallons. And it never fills up. Never, never.”

As recently as last year, Señor García explained, there were two water-hauling companies. But the second company had gone out of business. “Before, the guy who sold us (2,500 gallons for) $65, he quit. He sold his company. Now, it’s a monopoly. And now the new owner is a higher price.” Each month, Señor García paid for two loads of hauled water and bought additional bottled water for a total water bill of about $170/month.

As a result of this pricier water, he had to cut back on his water usage. “The trees are dying because they lack water,” Señor García observed, pointing out the window. “This is the second one that has died. That’s a dead one. That one died. It’s very expensive to maintain the trees. I try to put the water on these trees, but it’s not enough.”

Señor García explained that his frustration stemmed from the fact that it was beyond his ability to control the price of water. It seemed to him like the price could—and had—gone up without cause or warning. What was to stop it from continuing to rise? These concerns were particularly acute when he thought about his children. “This boy grew up without water,” he lamented. “My boys are growing up without water.” With these frustrations in view, Señor García said his main aspiration regarding water was clean, reliable access. “The big problem is that we are, like, a quarter mile from the big pipe here. It’s potable water here, but we can’t access this pipe. One quarter mile!”

Señor García’s expressed frustrations arose from a feeling of helplessness in his ability to maintain reliable access to water for his family and household needs. This sentiment was echoed by residents throughout Cochran and Las Pampas, who often explained that their connection to water was subject to breakages and discontinuations. Moreover, these discontinuations were

beyond their powers to control. Without consistent, reliable access to water, Cochran and Las Pampas families lived in a state of water insecurity, sometimes having to go multiple days without water for showering, cleaning dishes, and washing clothes. For example, multiple Cochran residents explained that the cost of hauled water began to drastically rise when one of the two water-trucking companies on which they relied went out of business. “It used to be $30, then it went to $40, $50, $60. Now, we pay $75 for (each load of) water,” explained Cochran resident Mario Meléndez. “When the other company closed, that’s when the price went up,” said another resident. “They started charging us more. It’s a monopoly.” One mother, Veronica Pérez, expressed concern that almost the entire community relied on water from one trucking company. Recalling that the other company had suddenly closed down, she said, “I’m worried. What would we do if (the remaining company) stops delivering? What if they go out of business, too?”

In her household, Señora Martinez explained that she consistently fretted that the family’s tank would suddenly run dry. “You have to watch it all the time,” she said. “Sometimes, it lasts three weeks. Sometimes, it’s gone in just a few days.” The water-hauling company could not be trusted, she explained, and they often brought less than the 2,500 gallons for which the family paid. Señora Martinez further explained that if the water depletes, the pump runs until it burns out, meaning she constantly has to monitor it. “Sometimes, you call (the water-trucking company), and they don’t answer or they can’t come.” Consequently, her family has gone without hauled water for days: no shower, no dishes, no washing clothes. “In the summer, when it gets hot, it can be very hard.”

In her household, Señora Hernández told me the family’s truck for hauling water (the 1994 Ford Ranger mentioned above) required constant monitoring and maintenance. As it pulled into the backyard one afternoon, the truck strained under the weight of the heavy water tank,

which, when full, weighed more than a ton. She explained that her family feared the old truck's days were numbered: "We are always worried that our truck will break," she said. "If the truck stops working, what will we do then? This is how we get water. We can't afford to pay (the water-hauling company)."

Senora Hernández expressed additional concerns related to unreliable water access. For example, the family lacks a central heating unit and relies on propane or wood-burning stoves to keep the house warm. "Basically, we're like Juarez," she explained, "and what if we use a propane tank to heat up the house? Over here, we don't have a fire hydrant to put out the fire. They'd have to bring their own water." Señora Hernández described an event when she was running errands away from her home and she heard on the news that there was a large brush fire in the desert near Cochran. She feared the fire would sweep over her home. "When I was coming back from the store, I called the operator. And she was asking, 'What's the address?'" Her address would not show up on the operator's navigation device. "And I said, 'I really don't know, because it's in the middle of the desert. I'm over here on Buffalo Road. So, it's things like that. Sometimes, people's lives are in danger. It takes them a while to get out here with the ambulance or the firetruck. If a fire comes out here much faster and then they don't have water, they have to bring their own, and they might not get here in time."

These descriptions of water insecurity portrayed how lack of access to reliable water services kept Cochran and Las Pampas residents in states of water precarity. Water supplies were either of poor quality or subject to breakages, discontinuations, and/or rising prices. In this way, water precarity kept residents one step removed from the more dire predicament of water scarcity. Combined with economic injustices and other hardships detailed above, these findings point to the urgent need for ensuring Cochran and Las Pampas residents receive reliable water

services. To that end, this report now turns to an ongoing struggle mounted by Cochran residents to achieve adequate water access.

3.3: The struggle for access: Belonging and exclusion in the hydrosocial waterscape

Cochran residents referred to Mario Meléndez as"nuestro nuevo lider,"our new leader, an informal title he had assumed when he decided to take on the challenge of connecting his community to water. Thin, thoughtful, and mild-mannered, Mario knew well the hardships associated with water insecurity. "I've been here all my life," he said. "I'm 22, and it's the same struggle."

Mario lived in a household of four: himself, his mother, his father and his uncle. Before he was born, his mother and father bought the land in Cochran. They lived on the lot in a mobile home. While his father worked, his mother built the house. She poured the concrete foundation. She laid the bricks. Mario said he was proud of his mom for the work she had done. He showed me a fireplace she had constructed by hand: "If you see it, it's a bit crooked," he explained. "The wall bulges out a little. But that's because she did it herself. So, I give props to my mom. She did a good job."

When his parents first moved to Cochran, they knew the property lacked water; that's why it was affordable. But Mario explained they selected this particular lot because there was water service in the nearby neighborhood. Choosing to live here was a strategic plan, he said, an investment: "Since they had water in Agua Dulce, they (my parents) were like, 'Look, they have water right there. So, they're gonna put the water first in this area. Let's move here.'" That was 24 years ago. To this day, the family lacked water service.

Mario worked at a call center and attended El Paso Community College. He planned to enroll at UTEP, where he would continue his studies in criminal justice. "I like action," he told

me. “I like being in suits.” Eventually, he hoped to land a career in the secret service. For now, though, he worked hard at maintaining his grades and his job. Each month, his family spent about $170 on water, $150 of which went to paying la pipa. Mario contributed part of his paycheck to his family, and much of his contribution went to covering the costs of water.

Like many in Cochran, Mario expressed concerns that water costs were rising. “It started with $45, then it went to $55, then they went to $60, and now it’s $75,” he explained. “My last understanding, my neighbor over here, he just told me he paid $80, just last week. So, I think it’s going up again.” When his sister moved out and into another neighborhood with access to water, Mario discovered her family only paid $40 a month for water. “I don’t think that’s fair,” he said. “Why do we have to pay so much just because we’re here? What’s the difference between them and us?”

In 2015, he began to involve himself in the community’s efforts to get connected to water. This “fight,” as he often called it, had been going on for a long time. “My parents started everything, fighting, but they gave up as well. So, I don’t know why, but I was like, ‘I’m going to start fighting.’ And I told my mom, I was like, ‘I’m going to go into this. I’m going to do it.’ And she was like, ‘If you’re gonna do it, you better step up. Don’t just do it halfway.’ And I was like, ‘No, I’m going to do it.’ And that’s when I started, and they all started supporting me. They said, ‘Go for it. We have your back. We want this.’ So, everything was good. We started having progress.”

In 2016, he hosted a series of meetings at his house. During one meeting, a county commissioner, county engineer, representatives from the local utility districts, and the colonias-representative from the Texas Secretary of State were all in attendance. Hopes in the community ran high. Suddenly, the “powers that be” were taking notice. A plan was made to set up an

agreement that would connect his community to the water main operated by the Horizon Mutual Utility District, a line terminating less than .25 miles away. They were going to "bring two pipes on the sides and connect them," Mario explained. "Those were the plans."

But that was three years ago. "It was supposed to take a year or 8 months," Mario said. "But, until now, we haven't received the water. And the lady that was helping us kept saying they were still looking at it. All the sudden, I found out—she was the secretary for the state—she quit her job. So, they didn't even tell us nothing."

The 2016 meetings represented the high-water mark in terms of the community's hope for getting access to water. Since then, Mario has called county representatives. He has written letters. He even got Telemundo, the news station, to visit his home and report on the daily struggles for water. But it was all nothing doing. "I would try again," he said, "but we get tired, too. We get disappointed. It gets to the point where you're like, 'ah, what's the point?'"

Mario said his neighbors were tired of fighting, too: "I mean, I talked to some, and they still have hope. But then I talk to other people, like the one all the way in the corner, and she just says, 'Mi hijo, just leave it how it is. We're used to it.'"

But Mario admitted he has a hard time letting go. He wanted people to stay in the fight. "Do it for your kids or your grandkids,'" he told them. "You don't want them having a hard time. Let's keep fighting for this.'"

Someday, Mario said, he plans to move on, to continue his studies and pursue his dream of becoming a Secret Service agent. But he had a goal for Cochran first: "That's my dream," he explained, "to leave from here, but to see the water get here before I take off. To be like, 'Ah, I helped. I helped bring the water.'"

Mario Meléndez's long-running struggle for an infrastructure project was indicative of the extent to which the community aspired for water access. Conversely, his remarks demonstrated how "the fight's" prolongation had taken a toll. As Mario noted, the struggle had fatigued his parents, himself, and many of his neighbors. His moniker, 'our new leader,' illustrated that the movement had spanned multiple generations; as older generations tired of the fight and grew apathetic and calloused in the face of its futility, new, more idealistic generations had begun to take up the banner for water. As a consequence, residents appeared to have mixed feelings with respect to their hopes for water access, their ongoing willingness to continue fighting for it, and a sentiment of apathy borne of the futility of continuing a seemingly interminable struggle that met with no tangible results.

This section presents findings from my evaluation of the hydrosocial waterscape. I trace the discourse at the community and decision-maker levels to reveal disconnects between residents' desires for water and decision-makers' reasons for why it cannot be delivered. In taking this "relational perspective" (Jepson et al., 2017), I present mixed sentiments among Cochran community members respecting the struggle for water access. These complex feelings arose directly from being in the precarious bind of needing water access but having such access continuously denied. With these sentiments explained, this results section then explores key disjunctures between residents' professed needs and decision-makers' rationales for being unable to deliver water access. As I will show, these rationales reinforce feelings of abandonment and resentment. Finally, I zoom out to offer a view of state and federal-level politics, which clearly show how neoliberalism has set the conditions for the continuous reproduction of water insecurity. In taking this relational perspective, I ultimately show the extent to which water

access—or exclusion to water access—is socially, politically, or economically constructed within the "hydrosocial waterscape" (Jepson et al., 2017).

3.3.1: Between fatigue and anger: Water discourse in Cochran community

To begin, we turn our attention to the discourse on water access in the Cochran community. On the one hand, residents remained steadfast in their desires for water access; 10 of 11 householders expressed a strong desire to have their homes connected to infrastructure. On the other hand, several grudgingly admitted to a sentiment of acquiescence. These mixed feelings were displayed by Veronica Pérez during my interview with her. At the beginning of the interview, she said, "I don't understand why they won't bring us water." She went on to express concerns over the fact that many in her neighborhood relied on the water-hauling company. "In the future, what if something happens to (the water-hauling company)?" she said. "We'd have to go on strike. We'd have to block the roads like they do in Juarez." These comments demonstrated water infrastructure's aspirational qualities. Residents in Cochran often spoke wistfully of an infrastructure project. They desired water not only for its utility, but also because water access conferred an achievement in terms of social and material success. These sentiments were echoed by Juan García, who commented that his children were growing up without water access; in doing so, he implied that lacking water access had rendered him and his family second-tier citizens. "The Agua Dulce people bring their dead dogs here," he explained. "Dead cats, dogs, cattle, horses. Everything around here. You can smell it." He attributed the conversion of his neighborhood into a dumping grounds to the lack of water and sewer services, which created a "place of contamination."

However, as my conversation with *Señora* Pérez continued, she described how she and other residents had been trying for decades to achieve water access. Since these efforts had failed

to materialize, the community had adapted. *Señora* Pérez had learned to live without water, and, in an expression indicative of resignation, she finally concluded, "No, I'm in my comfort zone. I'm okay with this."

So it was that Cochran residents described their deep dissatisfaction with the status quo, a discontentment intermingled with both resignation and varying degrees of hope. Antonio Flores, for instance, expressly stated that he still hoped for water access. When I asked him to share his view on what his neighbors thought on the subject, he explained, "They want the water, but their hopes are down. It's been more than 20 years." This complex mix of dissatisfaction, resignation, and hope often led to conversations in which residents described their abandonment, their relegation to the margins, and the ultimate unfairness of their water-insecure situations. In my field notes, I counted 33 references to abandonment made by 11 (100 percent of) residents. These took the tone of being left out, being forgotten, and/or being made to fend for themselves. Many times, residents described their community in relation to others around them. In the seemingly haphazard course of development, nearby neighborhoods had received water or sewer access. Having slipped through the cracks, Cochran residents felt left behind. Mario, for instance, explained that neighborhoods to the south, east, north, and west had been connected to water. "Why do they get water and not us?" he asked. (In my conversations with decision-makers—detailed below—this situation of being surrounded on all sides by communities with conventional access to water, was described as a "donut hole.") One resident described the donut-hole of neglect despite years of participation in the processes that were supposed to deliver water in this way:

> We had gotten some grants, but they were not given for this part, even though we went and supported them on all the meetings that they had. But the money all ended up over

there. They were used in La Coyotera, Agua Dulce, and Montana Vista. But over here, they think that we're not that many people living here. So, they decided to use the money over there instead of over here. But we have fought for it. So, now, it's like, 'Well, what do we do now? Who do we talk to?'

Residents often voiced these sentiments of being left behind in terms of dissatisfaction with local representatives and utility districts. For example, when I asked Rebecca Meléndez, Mario's aunt, who lived next door to Mario, what she thought about the 2016 meetings to secure water access, she rolled her eyes. "*Puro promesas*," she exclaimed. "They said, 'Yes, we can bring water here.' But they never did it. We're still here without water." Another resident, Filomena Martinez, echoed this sentiment: "I knew they were having meetings. But nobody said anything after that. Nobody took an interest. You always hear, 'Who's going to put the water? Who's going to put the water?' But nobody ever does it." *Señor* Flores tried in the past to work with the city and county to get water. "They say we're not from Horizon. They say we're not from the city. They say that we're nobodies." In much the same vein, *Señor* García equated representatives' claims that they would deliver water access to empty promises: "It was only for the elections," he said, "and then, after the elections, they never come back."

3.3.2: Exclusionary rationales: Water discourse among regional decision-makers

While learning about Cochran residents' aspirations for water access, it became apparent that I would need to understand why Cochran had been for so long excluded from an infrastructure project. Indeed, several residents directly asked me to help them figure this out. Specifically, they wanted to know why the process they had initiated in 2016 had faltered. Why were no updates given? What had been the fate of the plan to connect them to nearby water pipes? With these questions in mind, I scheduled a series of meetings and interviews with

decision-makers. Over several months, I spoke with county commissioners, water utilities, staffers from the office of a state representative, and federal agency administrators and staff about Cochran's particular situation. We also spoke generally about *colonias* and water projects. By looking at the specifics of Cochran's situation alongside the larger *colonias*-and-water landscape, I was able to more fully interrogate the context of water insecurity in the hydrosocial cycle. Cochran's circumstances are not unique; in fact, these conditions are replicated in hundreds of small and isolated *colonias* all along the U.S.-Mexico border. For this reason, as a case study, Cochran is illustrative. Insofar as the community offers a prism through which to view the continuous reproduction of no-win waterscapes, Cochran affords a glimpse into the discourse and underlying factors of exclusion—the ultimate result of which are the conditions of water insecurity detailed in the previous section.

Perhaps unsurprisingly, the primary reason decision-makers gave for their inability to connect the community to water was the project's high cost and their organizations' tight budgets. All decision-makers with whom I spoke expressed a desire to connect the community to water. But these stated desires failed to translate into action in large part because of financial constraints. In an interview with a county engineer, I obtained estimates for the cost of a water project. To run the pipeline less than .25 miles and to "loop the system" throughout the four streets, a consultant for the Horizon MUD had estimated the cost at $1.6 million. This cost estimate became interesting for several reasons. For one, Cochran residents contested the estimate. Additionally, these figures had not been provided to Cochran residents, who told me they had been left in the dark following the 2016 meetings. When I explained the costs to residents in follow-up conversations in 2019, they were mystified and perplexed—in part because this had been their first time hearing the costs, but also because the costs seemed

extremely high. Mario, for example, shook his head. "No," he said. "How could it be so much?" His neighbor, Señor García, laughed at the estimate. "But it's only ⅛ mile!" he said. "Or less—200 yards, 150 yards! It's really close. This is not true, this. This is not true. Maybe if we were 10 miles. But we're not."

Several Cochran residents told me the county or the utility districts should find ways to reduce the cost of the project. *Señor* García stated the residents themselves could help dig the trenches. He expressed a willingness to pay for a loan. He also mentioned plastic piping that could help reduce the costs. These comments revealed how there was not only a disconnect between what residents thought was a realistic cost for the project, but also disconnections in understandings about the project's process and procedures. Residents demanded flexibility to meet their basic water needs. They pointed to informal mechanisms that could reduce costs. Their need for water, in this estimation, outweighed the need to do things "by the book." Decision-makers, meanwhile, described rigid rules and codes to which the project and the residents themselves would have to conform. In residents' eyes, these codes, rules, and regulations artificially drove up costs and arbitrarily kept the water project they needed at arm's length. Yet decision-makers expressed being beholden to the process and its attendant set of procedures, environmental impact statements, surveys, design processes, and construction codes.

Conversing with the county engineer, for example, I discovered that tearing up and repaving roads accounted for about $600,000 in the cost estimate, or about 37.5 percent of the total cost. Residents thought this was an absurd sum for a mostly unnecessary step in the process. They pointed out wide shoulders on either side of the roads. Engineers could design the project such that pipe could be laid alongside the road to save on those costs. However, the county engineer expressed that redoing the road was required. "The problem isn't so much running the

pipe to the edge of the subdivision," he said. "You have to 'loop the system,' running pipes around the whole subdivision, branching pipes down each street, and providing stub-outs for all the lots. This involves cutting the paved streets and repaving them; per code, they must be restored to the same or better condition." (As it would turn out, Cochran residents were right about the inflated costs of the project. In late October, the Lower Valley Water District produced a new project-cost estimate. With creative engineering, avoiding tearing up all the roads, and performing design and construction work in-house, rather than with outside contractors, they reduced the project estimate by $1.1 million. See this discussion in the epilogue.)

According to several decision-makers, costs were furthermore prohibitive because the project would benefit relatively few people at great expense to local taxpayers. Every decision-maker with whom I spoke described the "cost-per-connection" metric, which is used to rank the priority of water projects. Since the project cost was set at $1.6 million for Cochran and there were only 23 households on record, the cost-per-connection could run to between $69,000-$74,000 per household. The same county engineer called this cost-per-connection "extremely high." Typically, the maximum cost-per-connection for grant funding was about $25,000, and "$30,000 is all but unheard of." This high cost per connection was the primary reason for the stalled effort to bring a project, according to the engineer. "We can't identify or secure funds to do such a thing," he said.

The issue of high costs-per-connection was repeated by the El Paso County Commissioner who had been involved in the 2016 meetings at Cochran. The Commissioner outlined a history of funding for water projects; these funds had covered most of the *colonias* in the county, except those that were small in population and distant from existing water infrastructure. Consequently, the "remaining *colonias* (without water services) are few and far

between," he explained. Looking at a map of the county, he pointed to Cochran and said, "There aren't many connections here, and when you have sparse subdivisions, it creates issues." If the county were to fund a project, it would have to pass the costs on to the general rate payers. The Commissioner explained that he was reluctant to raise the costs of water or taxes for all county residents when the project would benefit so few people. Consequently, Cochran residents found themselves in a Catch 22. The Commissioner said he could only back a project if grant funding was obtained. "Problem is, grant funding is hard to come by when it's such a high cost for connection," he stated.

At the Environmental Protection Agency, an engineer with the Border Water Infrastructure Program explained that Cochran was not ranked in the highest-tier priority, again, because of cost-per-connection. "It all boils down to cost," the engineer explained. "They're isolated, 10 to 20 homes. The City of El Paso wants to provide drinking water. However, 10 miles out, for 20 homes for water, it may cost $15 million. That's almost $1 million per home." At that rate, he said, "it would be cheaper to relocate all those people back in the city and put them in half-million-dollar homes." Not only that, but grant funding for water projects was getting harder to come by. During the past decade, explained the EPA engineer, the mode of delivering federal funding had undergone a transformation. This was especially true for the North American Development Bank, an institution created as part of a side agreement to the North American Free Trade Agreement of 1994. In the past, the North American Development Bank and its co-institution, the Border Environment Cooperation Commission, offered more funding for low-income communities in the form of grants. Now, the North American Development Bank was transitioning to loans, he explained, which required a down-payment from residents, as well as the recouping of project costs as investments. "The idea is for the

communities to have skin in the game," he said. "A lot of times, if federal money is spent, if we spend 100 percent, and they're not invested, infrastructure is not maintained."

This shifting funding landscape put Cochran residents at a further disadvantage. Since grants were harder to attain and precluded by the community's small size, the next best option was a loan. However, the cost of the project was so high that a $1.6 million loan would generate onerous upfront costs for low-income residents, to say nothing of high monthly interest payments. In this way, costs-per-connection, a rigid institutional environment, and Cochran's small size continuously converged to rank the community out of water-project priority lists. We will return to the matter of costs below, paying attention to its embeddedness in a neoliberal context. First, however, this matter of ranking warrants increased attention. For Cochran residents, their inability to rank in water-project priority lists was the direct cause of their exclusion and consequent sentiments of abandonment. In my conversations with a staff member from the office of a state representative, I learned a *colonia* could be listed as "high priority" for Texas Water Development Board projects on the basis of five criteria. Conversely, by lacking any one of these criteria, a community would be kept off the list. To be prioritized, a community had to:

- demonstrate that median household income was less than 75 percent of the median state household income.
- have inadequate facilities to meet residents' minimal needs.
- show that financial resources were inadequate to provide water supply or sewer services to satisfy minimal needs.
- prove that the area was an established residential subdivision as of June 1, 2005.

- and show that the area had a political-subdivision sponsor, such as a water utility or county government.

Cochran, explained the staffer, met all of these criteria, except for one: the community lacked a political-subdivision sponsor. Existing as it did in a jurisdictional "donut hole," no utilities or governments were responsible for ensuring the community received water access. So long as it was denied access to the priority list, Cochran remained disqualified from the Texas Water Development Board's "Economically Distressed Areas Program" funding.

The irony of this exclusion loop, this donut hole into which the community had been thrust, was not lost on Cochran residents. Frequently, they expressed confusion and disbelief when describing the essential conundrum of their circumstances. As one resident put it: "They say we're not from El Paso. We're not from Horizon. We're from the Lower Valley. Now, all the sudden, they say we're from El Paso. And so, we're like, 'Where are we from? Are we from Horizon? Are we from El Paso County?'" Residents were also baffled that they paid taxes yet did not receive essential services like most county constituents. How could it be that they pay taxes yet exist in a donut hole? To hear one grandmother say it: "Our piece of land is not worth that much because we don't have anything, and still they raise our taxes, our property taxes and stuff like that. And it's not even worth anything because we don't have the most vital resources here. We only have electricity and a cesspool."

During interviews, decision-makers also called my attention to jurisdictional boundaries. Their intent was to explain how these boundaries excluded Cochran from their zones of responsibility. For example, the Commissioner explained that, although the County operated a small water utility, it was nevertheless not the responsibility of the County to provide Cochran water. This was because the utility had been set up to serve a much larger *colonia* in another part

of the county; Cochran was not within their jurisdiction. Similarly, in my initial meeting with the The Lower Valley Water District, decision-makers pulled up a GIS map that overlaid bright blue boundary lines on the county's geography. Cochran, they explained, was just north of the blue line, not within their district. Hence, it would be very difficult to get approval to extend a water pipeline into a community that was beyond their jurisdictional boundaries. This was further complicated because, if they were to run a water line to Cochran, they would have to cross through the jurisdiction of Horizon, a separate small utility. Crossing through their boundaries would require the boards of both districts to pass a special agreement called an interlocal sharing agreement. The County Commissioner and Engineer both noted that Cochran was in a quintessentially exclusionary non-jurisdiction, a sort of no-man's land, known as a Certificate of Convenience and Necessity, or CCN. The CCN, they explained, was the official term for the donut hole. On maps of the county, they pointed out numerous neighborhoods, street blocks, and assorted communities that shared this designation. These were, like Cochran, places left behind in the development of water services, skipped over either intentionally or not.

It was often noted in these conversations that the Horizon Regional Municipal Utility District was the closest utility to Cochran's boundaries. I attempted to get in contact with the Horizon MUD on numerous occasions, sending emails through an online form and making phone calls. It was not until a later phase in the research project, when I was presenting results obtained for a water-insecurity report, that I was able to schedule a meeting. I presented the report about Cochran to two Horizon MUD representatives. I had hoped to get into a discussion on extending their nearby water line to Cochran, but the representatives were in a hurry. Originally, they had forgotten that we even scheduled the meeting. Then, they thought I was there for a job interview. Wrapping things up quickly, they told me they would discuss the report

with the Horizon MUD board. When I followed up to ask how the board meeting went, I never heard back. In the absence of comment from Horizon MUD, I attempted to piece together an understanding for why they would not extend water service to Cochran. For one, it was pointed out that Cochran was not in the Horizon utility's jurisdiction, but, rather, just beyond it. Moreover, it was widely discussed among people involved in securing funding for water projects in the area that the Horizon MUD was generally not amicable to extending service to *colonias* outside their boundaries. "Horizon MUD has a reputation for not wanting to do more projects like these," according to one decision-maker. "They're not in the business of extending service, only maintaining service. They don't see a lot of revenue potential."

On these terms, then—that the project cost too much for too few people, that the agencies and organizations lacked funds, that Cochran existed in a jurisdictional "donut hole," and that Cochran could not "rank" on water-project-funding lists—residents were kept in a state of water insecurity. In evaluating this discourse and its disjunctures, we see not only how Cochran residents themselves contested the strict ranking criteria and institutional rigidity that continuously excluded them from basic water services, but also how arguments, or rationales, for not funding a project pivoted on matters of jurisdiction, geography, population, and economics. In this contested discourse, we witness a political ecology of exclusion to water access, wherein fiscal solvency, lack of funding, deafness to political voices, institutional inadaptability, and the commodification of water as a good to be purchased, rather than as a right or basic need to be provided, rule the day.

Up until now, this review of the hydrosocial waterscape has described many political-economic factors layered up against Cochran mostly at a localized level. To review, I have shown how Cochran residents have maintained their struggle for water for decades, contending

with a rigid political process that would not bend to their needs. Nor, for that matter, would the political process go so far as to grant them their existence as legitimate residents deserving of water access. Further, the results revealed numerous binds and barriers created by funding regulations, jurisdictional donut-holes, ranking criteria, and shortfalls in available funds. Together, these factors, alongside poverty, lack of representation, low population density, and geographical remoteness, constituted a hydrosocial waterscape of exclusion. However, the particular political ecology at work in this case study also connects with a much larger series of events, that is, "the local" in articulation with "the state" and "the national." Namely, interviews with decision-makers and observations from the field revealed how water-project funding—and, consequently, the ongoing shortfall in water projects for unserved U.S.-Mexico border populations—has steeply declined as a circumstance of the neoliberalization of the borderlands. This presentation of results will now turn to this larger-scale view of the hydrosocial waterscape. By doing so, I demonstrate how the neoliberal political-economical regime, particularly prevalent in conservative Texas, adversely affects low-income communities living without water access in the borderlands.

3.3.3: Waning state and federal support: Water discourse at state and federal levels

Before proceeding, a note for definitional clarity. By "neoliberalism" here, I mean a "theory of political economic practices" (Harvey, 2007, p. 22) that places primacy on markets and commodification as the preferred engines for human development. Neoliberalism's roots date to the Chicago School of Economics and experimental economic overhauls in Chile in the 1980s (see Han 2017). Its tenets have since advanced across the globe, exported through financial networks and worldwide institutions such as the International Monetary Fund and World Bank, so that it can now be described as a globalized political-economical regime (Harvey

2007). In brief, neoliberalism holds that governments should provide an institutional framework for securing "private property rights, individual liberty, unencumbered markets, and free trade" (Harvey, 2007, p. 22). Beyond maintaining conditions conducive to these precepts, "the state should not venture" (Harvey, 2007, p. 23). Neoliberal political economy is characterized by an ethos of individual responsibility, withdrawal of governmental regulations on industry, and a retreat of state funding in social and environmental programs (Han, 2017). On these grounds, neoliberalism has been widely criticized. For example, Harvey writes:

> The creation of this neoliberal system has entailed much destruction, not only of prior institutional frameworks and powers (such as the supposed prior state sovereignty over political-economic affairs) but also of divisions of labor, social relations, welfare provisions, technological mixes, ways of life, attachments to the land, habits of the heart, ways of thought, and the like (Harvey, 2007, p. 23).

This definition established, let us return to our analysis of Cochran in the context of environmental-infrastructure projects. Although many decision-makers explained they could not deliver a water project for reasons outlined above, all of them expressed a desire to connect Cochran and other unserved communities to water. The County Commissioner stated he would connect Cochran to water if he could. "Cochran and Horizon keep coming up," he explained. "We haven't directed the staff to stop. Staff keep looking for funding options. It's a matter of finding a favorable grant or funding. I'm optimistic that someday this happens." Likewise, the County Engineer acknowledged Cochran residents' struggle, stating strongly that all residents in the county should be connected to water: "They need a solution," he said. "They want a solution. They've been trying to figure out who's going to service them." Similar statements were made by EPA officials and Lower Valley Water District staff. In making these statements, it was clear

that decision-makers thought of themselves as—or at the very least expressed themselves to be—allies in the quest to have all county residents connected to water. However, these expressions of support were often couched in a larger discourse of having their hands tied. For example, in his very next phrase, the County Commissioner qualified his reasons for why the county could not provide water services to all of its residents. "Problem is, funding across the board is in decline. We would need the State to allocate funding at the same level. But EDAP was zeroed out last year. That's funding we used for grants for Montana Vista (another El Paso County *colonia*). Even USDA project funding was slashed."

This statement about declining funding for water projects was echoed in some form or another by representatives from the EPA, the Lower Valley Water District, state representatives and their staff, and the Director of the North American Development Bank. Furthermore, these comments were corroborated by data on state and federal funding allocations for environmental infrastructure in the border region. Water projects along the U.S.-Mexico border have historically relied upon funding from several important programs and governmental institutions. These include the Texas Water Development Board, which oversees EDAP, and the EPA, which has channeled funding through the North American Development Bank and its sister institution, the Border Environment Cooperation Commission. In particular, the North American Development Bank and Border Environment Cooperation Commission administered federal funds through the Border Environment Infrastructure Fund, BEIF, and the Border Water Infrastructure Program, or BWIP. All three of these major water-infrastructure programs—EDAP, BEIF, and BWIP—saw major cutbacks in their funding since the post-NAFTA heyday of the late 1990s.

This state and federal retreat in funding occurred amid a neoliberal climate that favors reduced funding for environmental projects. For example, throughout the second half of the 1990s, presidential budget requests for environmental projects showed a steady decline (Table 3). During this timeframe, congress allocated between $115 million and $150 million each year to border-environment infrastructure projects through the EPA. In contrast, yearly allocations have remained below $50 million since 2007 and sank to a low of $15 million in 2018 (these figures were drawn from my analysis of Congressional Budget Office documents, see Ramseur and Tiemann, 2018). These cutbacks were acknowledged by EPA staff: "At the beginning of the program," explained the EPA engineer, "we were getting $100 million. Then $75 million. Then $50 million. Then $25 million. One year, it dropped to $10 million." Most recently, the White House attempted to zero-out entirely the EPA funding allocation for BWIP. Were it not for the efforts of senators from border states, particularly New Mexico and California, the program would not have received any funding at all.

Table 5: Presidential requests for EPA funding for BWIP:

Presidential Requests for EPA funding to Border Water Infrastructure Programs (1995-2018)

Source: Water Infrastructure Financing: History of EPA Appropriations Congressional Research Service, Aug. 1, 2018

1995	$130 million	2003	$123 million	2011	$20 million
1996	$150 million	2004	$98 million	2012	$20 million
1997	$150 million	2005	$94 million	2013	$20 million
1998	$125 million	2006	$69 million	2014	$15 million
1999	$115 million	2007	$40.6 million	2015	$15 million
2000	$128 million	2008	$25.5 million	2016	$15 million
2001	$100 million	2009	$20 million	2017	$22 million
2002	$75 million	2010	$20 million	2018	$0

Even so, a strong argument can be made that $15 million amounts to a drop in the bucket when water projects are notoriously costly and that $15 million is meant to cover water infrastructure across the entire 4-state, 2,000 mile border area. Border counties are characterized by poverty and highly dependent on state and federal funding to get costly projects off the ground. According to a recent (2017) Good Neighbor Environment Board report, if all the counties along the border were formed into a state, it would rank 51st, or "dead last" in terms of income. The same report outlined an array of environmental hardships faced by border populations, including water-borne illnesses, air pollution, rising temperatures, and climate change. Without funding, then, already vulnerable populations on the border are left even more susceptible to environmental threats, most of which have their origins in industrialization at various scales. As one official with the North American Development Bank told me, "There's definitely a risk, and there continues to be a lot of needs out there, and there's still first-time service needs. But there's also a lot of environmental vulnerability as well, with aged infrastructure and leaking sewer pipes and things like that." Even though the funding has declined, she explained, "the needs don't stop." The EPA engineer echoed this sentiment. "Our need is much more than what we're getting," he said, citing an estimated $250 million for BWIP projects in the pipeline this year. At $15 million, he stated, "that's 25 years of current funding appropriations."

Declines in funding for environmental-infrastructure projects have been accompanied by a restructuring of the BECC and NADB, sister institutions which worked hand-in-hand with frontline border communities to identify, design, and engineer projects that would improve environmental conditions and, consequently, human health on the border. Working together, BECC and NADB were widely considered to be among the most comprehensive programs for

offsetting the negative externalities associated with border industrialization. To grasp their role, as well as the importance of their rise and decline, a brief history is in order.

BECC and NADB were officially created as side agreements to NAFTA in 1994, but the binational, philosophical groundwork for the institutions was laid more than a decade before, under the La Paz Agreement of 1983. La Paz recognized that environmental issues in the borderlands—such as those affecting water, air quality, wildlife migrations, habitat integrity, and the like—tend to transcend the international boundary line (Ingram and Fiederlein, 1988). La Paz put forth a framework for bilateral collaboration on problems and projects affecting the borderlands—the first of its kind on the U.S.-Mexico border. The Agreement established a 100 km zone of inclusion on either side of the boundary. So long as projects were slated within the zone of inclusion, La Paz permitted U.S. federal funds, resources and employees to work on the Mexican side of the border, and vice versa (Mumme and Collins, 2014).

During NAFTA negotiations of the early 1990s, border communities and environmental groups connected the prospect for increased trade along the international border with an inevitable, associated increase in environmental pressures. These debates ultimately yielded BECC and NADB, "the most consequential of the NAFTA-generated institutions cooperating for environmental protection along the border" (Mumme and Collins, 2014, p. 312). From the outset, BECC and NADB focused on water and wastewater infrastructure. BECC mobilized boots on the ground. Engineers worked with border communities to coordinate and certify projects, and NADB provided funds for leveraging environmental projects of pressing need. It was recognized that projects to deliver clean water and sanitary living conditions to residents of the borderlands, millions of whom were U.S. citizens, would reduce the prevalence of illness and infectious disease (Gilbreath, 1992).

During the first five years, BECC and NADB undertook five times more border wastewater projects than their predecessor, the International Boundary Water Commission, had done in its 60 years of existence (Carter and Ortolano, 2000). As of Dec. 2017, NADB had financed and certified 244 projects, 113 along the U.S. side of the border, and 144 along the Mexican side. The project portfolio stretched along the border from the Gulf of Mexico to the California coast. It included 22 major water-treatment plants, 37 water-distribution systems, 53 wastewater-treatment plants, 89 wastewater-treatment-collection systems, and many more environmental projects. Today, more than 12 million border residents have improved drinking-water services, and wastewater-treatment capacity has increased by 316 million gallons per day. (NADB Director, personal communication, May 2018).

Despite this track record of success, federal support for environmental projects began to wane. BEIF grant monies, for example, dropped by 90 percent by 2007. Ten years later, BEIF put water and wastewater needs at $160 million—funds which could leverage $400 million for construction costs. Available funds, however, totaled $15 million (North American Development Bank, BEIF Fact Sheet, 2017).

Alongside this major drawdown in funding was a restructuring of BECC and NADB. Most significantly, in November of 2017, BECC was collapsed into NADB. With BECC no longer in existence, the model for funding, according to both the EPA engineer and NADB official, has shifted as well. “What we’re trying to do more and more of is trying to help communities be more independent of grants and to focus more on loans,” according to the NADB official. “An SRF loan is like a mortgage. It’s the best kind of loan you can have. It’s long-term. It’s pretty easy on your cash flows, and it can help your credit rating. So, we’re trying to move that way.” Additionally, the NADB official stated that the organization has expanded

and refocused its portfolio. No longer does NADB place emphasis on funding water projects; rather, the bulk of the organization's lending is "most heavily spent in renewable energy," according to the NADB official.

Why, when water projects have a proven positive impact on health and needs for water projects currently vastly outpace available funding, would NADB shift focus to renewable energy? The NADB official explained that it was a matter of cost, keeping the bank in good financial standing, and targeting the private sector with lending: "The loan programs in the bank were much more competitive in those sectors, which is private-sector project-finance structuring. So, we're talking about projects earning enough money to pay back the debt. Water and wastewater—it's more tricky."

Again, in these statements, and these developments, we can trace the logic of neoliberalism. First, though the merger of BECC and NADB were billed as an effort to "streamline" operations, it remains the case that one of the "most consequential" institutions for environmental-infrastructure projects has been effectively done away with—indeed, the institution whose very role was to work within the communities themselves. Call it "streamlining," but the downsizing or removal of social and/or environmental public institutions represents a hallmark of the neoliberal political ecology. Second, as NADB shifts from grants to loans, in order to make sure low-income residents have "skin in the game," as the EPA engineer put it, the financial burden for repaying financed debt transfers to the residents themselves. Whereas grants do not have to be repaid, loans do, and this fact is likely to have deleterious consequences in cash-strapped, low-income border communities. Third, the NADB official outlined a restructuring program whose stated goal was to move away from public-water projects and more toward funding private-enterprise renewable energy projects. This comment was rather

"on the nose" in its reference to neoliberal ideology, especially as it lines out the institution's plan to move funding from public goods to the private sector. In these ways, the restructuring of BECC/NADB demonstrates the extent to which neoliberal thinking has influenced two major cross-border, environmental institutions. Meanwhile, water-project financing at the state level bears similar neoliberalist markings.

State-sourced EDAP funding follows an analogous trajectory to that of federally funded institutions. Established in 1989 to provide first-time sewer and water services to "economically distressed" areas, EDAP was funded with a $500 million bond issuance—$250 million in 1989 and $250 million in 2007. As of 2017, those funds benefited 486,830 residents in economically distressed areas across the state of Texas (Texas Legislative Budget Board, 2016). By 2018, however, EDAP funds were exhausted. According to the EDAP website, "At this time, there are no funds left for EDAP projects." The Texas Water Development Board nonetheless calculated some $71 million is needed for ongoing construction costs. Additionally, the TWDB estimated more than $360 million is needed for future projects to serve economically distressed communities.

In an effort to meet those needs, Texas lawmakers from El Paso County introduced an amendment to the state constitution that would grant the Texas Water Development Board authority to seek another $200 million in bonds for EDAP. The Texas electorate would vote on this amendment during a statewide November 2019 election. During an October 2019 presentation on the proposition, Texas Rep. Mary Gonzalez said an estimated 400,000 Texans still lack access to clean water and/or sewer services. In the same presentation, Texas Senator Jose Rodriguez commented on the Texas political climate that has created these major budget shortfalls in the face of urgent need. He described a situation in which legislators were wrangling

over how much funding should flow into the cash-strapped EDAP program. Though he did not use the term "neoliberalism," his statement is indicative of the neoliberalist ideals of state withdrawal from social and environmental spending. "We were asking for $400 million to fund the EDAP program," he said. "The powers that be only wanted to give us $50 million." He stated that opponents to the proposition wanted it to fail because they were reluctant to raise taxes to fund water projects. Through negotiations, Rep. Gonzalez, Sen. Rodriguez, and others were able to increase the amount asked for on the ballot to $200 million. Yet even this amount is a far cry from the more than $430 million in estimated needs.

"We may be losing the battle for a cleaner environment in African American, 'pan-Hispanic,' and pan-ethnic communities generally," wrote Staudt (2017) in a recent chapter on activism, border industrialization, and environmental racism. In large part, this is occurring because of a neoliberal regime that favors limited government and abhors any form of restraint that might close out a profitable niche or curtail a market. Instead, as Staudt explains, "An ideology of individual responsibility prevails in the United States, and especially in Texas, relegating responsibility for health problems to individual behavior, not to public policy or business causes, thus burdening the impoverished."

I have argued here that this neoliberal project is at work in the hydrosocial waterscape of the borderlands. By tracing the discourse at different scales—the community, the localized region, and the state and federal—I have illuminated a new and direct analytical approach for understanding relationships in the hydrosocial cycle. By doing so, I have contributed to a growing literature that holds that such relationships largely predict and explain which communities are kept from basic water and sewer services. Jepson and Brown (2014) refer to this phenomenon as "institutional enclosure," whereby "the law and institutional form slowly

circumscribed arenas within which residents could demand access to domestic water from the state and society." In Cochran and Las Pampas, we have witnessed the adverse effects to those communities kept without these enclosed zones where, as Jepson has it, residents can rightfully demand access to domestic water. In the second major part of my results section, the community-level discourse, I presented the hardships residents have faced as a result of lacking water access, chiefly, economic, health, time, and stress burdens arising from being kept in water-precarious states of existence. Next, I traced the local-regional level discourse, wherein decision-makers and Cochran residents were at odds about the high costs-per-connection, the institutional rigidity, and matters of jurisdictional non-existence—all of which were contested discursive factors feeding into Cochran residents' sentiments of abandonment. Yet, the decision-makers with whom I spoke generally expressed a desire to connect all county residents to water. However, they themselves felt hamstrung by larger political processes and a growing gulf between available project funding and burgeoning environmental needs.

These results thus trace how the discourse of exclusion embedded in the hydrosocial waterscape is multi-scalar and exists within a larger frame of neoliberalism. The outline of this neoliberal frame is inherently characteristic in the drawdown of funding for environmental projects outline above, accompanied by downsized and/or restructured programs. By removing funds and attempting to close out programs designed to help impoverished residents on the periphery, the State, as Jepson and Staudt argue, shifts responsibility for health and clean water to the residents themselves. Not only is this shifting of responsibility to residents a hallmark of neoliberal ideology, but so too are the consequences visited upon the low-income residents—consequences which manifest in forms of mounting health risks, costly water, and arduous time and stress burdens. To put an even finer point on the existence of this neoliberal political ecology

in the borderlands hydrosocial cycle, I offer the discussion and comments made by Texas representatives, who said in no uncertain terms that environmental-project funding was curtailed by a powerful Texas political regime that opposed social spending—this despite the fact that as many as 400,000 Texans still lack adequate water and/or sewer services.

Waiting, hoping, and agitating for the access to water which would flow from adequate funding are communities like Cochran and people like Mario. On a recent, hot summer day, Mario took me to a shed behind his home. He opened the door and tossed aside a few sheets of fiber-glass insulation. He told me his family's pump had broken again, another expense to add to the mounting costs of ensuring his family had access to water. This thing with the pump had happened before. Whenever it broke, Mario explained, he knew how to fix it; he had to stand at the pump and manually toggle the latch. When his father took a shower in the morning, Mario was back in the shed, toggling the latch. When his mother needed to wash the dishes, Mario returned to the shed, flipping the latch. Laundry, showers, toilets, dishes—time and again—he went back to the shed to work the pump. "It's been a long time," he told me. "We're still here. Waiting."

3.4: Toward the soft path: diffusion of innovation, funds of knowledge, and soft path synergies for human capabilities

To this point, I have described a rather pessimistic set of circumstances. We have seen how low-income residents struggle to meet their daily water needs and how a multi-scale discourse, embedded in a neoliberal political ecology, has made the prospects of relieving conditions of water insecurity increasingly remote. As Hargrove et al. (2017) contend, many of today's *colonias* lacking adequate water and sewer services remain that way because they are "small, remote, and isolated." This reality was reaffirmed many times in my conversations with

decision-makers, who cited cost-per-connection, low population density, and remote locations as primary reasons for why water infrastructure remains beyond the reach of thousands of *colonias* residents. Indeed, Cochran and Las Pampas provide object lessons in this political ecology of exclusion. Both have existed for more than 25 years. Both communities were told at various times during their multi-decadal struggles for water access that a project was on the horizon. And yet both remain without piped water and sewerage to this day.

Hence, we face a conundrum. On the one side, we have residents with urgent need for water services. On the other, we have a hydrosocial cycle that, from their perspective, refuses to deliver. These long-running circumstances beg an obvious question: What are we to do?

In an attempt to answer this question, researchers have advanced solutions that broadly fall into two camps. In one camp, researchers such as Vandewall and Jepson speak to a need for widespread reform of structural conditions that produce so-called "no-win waterscapes." They point to shortcomings in technological quick-fixes and advocate instead for a societal transformation that aims at reconceptualizing underlying conditions. For instance, water access should be thought of in terms of relationships, rather than a static commodity to be secured. Vandewalle and Jepson go so far as to critique an EPA-sponsored university program to alleviate conditions of water insecurity using point-of-use filters as an ineffective intervention that deepens adverse impacts of neoliberalism.

Recently, however, other researchers and advocates have returned attention to pragmatic considerations, citing many of the difficult constraints to access I mentioned above: small populations, isolation, declining funding, and long-enduring conditions of water insecurity. Most directly, Hargrove et al. (2017) state that the continued failure to act constitutes an environmental injustice. Taking this line of reasoning a step further, Hargrove et al. (2017) advance a possibility

that the soft path to water "might be the water policy that can address the water injustice remaining in the U.S./Mexico border region." Meanwhile, other advocates and scholars, such as Cain (2014), discuss rainwater harvesting and similar soft-path interventions as potential means for addressing water insecurity. Writes Cain:

> A different path to solving the global water crisis that emphasizes efficiency and sustainable, community-scale projects in addition to centralized infrastructure, has been mapped by a range of scholars and activists. Small scale rainwater harvesting is one sustainable approach that is proving increasingly effective in both rural and urban settings in the developing world.

We can thus note a tension between the two camps, who would seem to espouse different approaches to alleviating water insecurity (for a fuller discussion of this debate see literature review parts 6-9). The work presented here charts a course that attempts to slacken that tension by demonstrating how a researcher need not advocate for one approach in lieu of the other. In other words, I need not focus on an examination of the hydrosocial waterscape—a technique advanced by Vandewalle, Jepson, and applied in this thesis above—to the exclusion of searching for and analyzing other applied solutions. Indeed, as Hargove et al. (2017) make clear, the urgent and ongoing needs of residents without water access—needs that have persisted for decades in spite of copious academic criticism—constitute environmental injustices that earnestly require solutions in the near term.

To that end, this thesis now turns to an examination of the soft path to water as a potential supplement for low-income residents living in conditions of water insecurity. While I will not argue that the soft path is preferred to conventional, hard-engineered infrastructure, I will make the case that it is an improvement to the status quo, which is, in a word, nothing. The soft path

could present itself as a middle path between doing nothing at all and centralized infrastructure. As we define it, the soft path relies primarily on four key principles: 1) decreasing demand for water through conservation measures and reduced use technologies, 2) increasing water supplies through improved use of local sources, such as rainwater harvesting, 3) improving quality of water through point of use treatment technologies, and 4) increasing water supplies through decentralized waste treatment and reuse. Through its emphasis on decentralized, small-scale infrastructure, the soft path is ideally suited for the rural conditions of many *colonias.* Not only does it show potential for reducing residents' costs for water (see Table 4 for a comparison of monthly/yearly household costs for water under current conditions, with soft-path improvements, and if infrastructure were installed at Cochran Mobile Park), but the soft path is less expensive than conventional water infrastructure to install.

Table 6. Household costs for water in Cochran: Current vs. soft path vs. utility costs

Amounts in dollars	Current Costs	Soft Path Costs	Utility Costs (Horizon MUD)
Per Month	147.37	86.90	12.58 +70.50
Per Year	1,768.44	1,042.77	221.46

This table displays the current average cost for water for households in Cochran Mobile Park alongside estimated costs if they were connected to the Horizon Mutual Utility District or if they received a compendium of soft-path technologies. Soft path costs were estimated by subtracting the amount of water saved if rainwater harvesting, low-flush toilets, and low-volume showerheads were installed on individuals' homes. Utility costs were obtained on the Horizon Mud website.

Despite these promising aspects, the soft path faces several barriers to implementation, including: 1) lack of knowledge of soft-path technologies that are feasible for particular circumstances; 2) lack of capacity to install and maintain technologies; and 3) lack of financial resources to purchase equipment and supplies necessary to implement soft-path technologies.

Furthermore, in order for the soft path to emerge as a viable development strategy, it needs to harmonize with the day-to-day lives of residents. A common pitfall in development projects manifests in the failure to establish baseline data as to whether the intervention, device, technique, or the like is interesting or desirable for end users. What good is a technological device if the problem it aims at fixing or its mode of use is anathema to the on-the-ground context? How could a given practice purport to represent a solution if it does not mesh well with the customs and lifeways of the users themselves? For reasons of cost and demographics and geography and decentralization, the soft path presents a theoretically exciting alternative. However, little data has been gathered on perceptions of its potential among low-income, developing communities (for one exception see Wutich et al. 2014). Moreover, this study is the first to gather and analyze data on residents' perceptions and use of soft-path strategies in U.S.-Mexico border *colonias*.

To establish this baseline data, I interviewed and surveyed 22 residents in two *colonias*. In Cochran, surveys were administered during repeat visits that occurred after initial interviews. Five of the 11 residents with whom I initially conducted interviews could not be contacted again on repeat visits for surveys, bringing the total number of surveys administered to 17 in both communities (6 in Cochran, 11 in Las Pampas). The surveys and interviews offered important insight into what residents themselves envision as workable, worthwhile solutions. As the work advanced, three themes emerged and became intertwined. First, in both field sites, I witnessed a diffusion of innovations, whereby soft-path technologies were implemented in a few homes, observed by others in the neighborhood, and, thereafter, desired and even independently implemented in other homes. Second, I was told in interviews and observed in person that several soft path elements were already utilized by *colonias* households. That these elements

have already been adopted speaks to a leverage point whereby soft-path practices and technologies fit in with existing funds of knowledge, which are defined as the historical, adaptive accumulation of skills, practices, bodies of knowledge, and cultural ways of knowing that have developed among members of certain groups or communities (Vélez-Ibáñez and Greenberg 1992). Respecting funds of knowledge, survey and interview results revealed instances where soft path techniques and technologies could map onto and mesh well with existing skills, practices, and ways of knowing. Finally, and perhaps most importantly, the results indicate that the soft path could fit in with residents' lives such that it builds upon existing funds of knowledge. In doing so, the soft path could alleviate burdens on peoples' time, money, health, and stress. By demonstrating the method's capacity and potential for freeing up human capabilities, I argue that the soft path removes substantial "unfreedoms," while advancing essential freedoms like those espoused in the work of Sen (1999).

For the survey, residents were asked to share their impressions on 20 total questions, 17 of which considered soft-path technologies and practices, one of which considered septic tanks, and two of which considered conventional, centralized infrastructure (specifically, traditional sewerage and piped-water infrastructure). Residents were shown a notebook with diagrams and photographs to help explain the technologies and practices. First, they were asked whether they currently used the technology or practice in question. If they said "yes," the interview typically moved on to the next question. If they answered "no," residents were then asked whether they would be "interested, not interested, or maybe interested" in implementing the strategy in their own homes or neighborhoods, or, alternatively, if they thought the strategy "doesn't apply." In administering this survey, I operated under the assumption that none of these technologies would paid for by the residents themselves. Rather, the soft path is envisioned as a service to be funded

by governmental agencies and overseen by water utilities. For that reason, a limitation in these results is that questions did not explicitly address residents' "willingness to pay." In most cases, the matter of expense did not come up. In the few cases that costs of the technology did arise, I noted it as a concern, then asked the resident to imagine whether she or he would be "interested, not interested, or maybe interested" in the strategy if it were provided for free, or, again, if it "doesn't apply." Finally, it is important to note that, in interpreting these results, one should keep in mind that residents who already utilized a soft path technology or practice were not marked down for being "interested" in using that technology in the future, primarily because they already used it in the present. In some cases, however, residents expressed they already used a given technology or practice, but were interested in learning more, expanding upon, or improving upon their use of that practice or technology, in which cases they were marked down as both: "currently using" and "interested." Additionally, some residents considering certain technologies were disinclined to indicate one response. For example, some residents thought a given strategy was not only uninteresting but also that it did not apply, in which cases they were marked down for both. Similarly, some indicated they were "maybe interested" but also that a given technology "doesn't apply," in which cases, again, they were counted for both.

On the whole, survey results indicated that *colonias* residents were more willing than not to consider soft path technologies and practices potentially useful and beneficial (see Figure 4). In all, residents answered 129 times that they would be interested in using the soft path technology or practice in question, 18 times that they would maybe be interested, 64 times that they were not interested, and 29 times that the given technology or practice does not apply. Out of 240 total responses to questions specifically regarding soft path strategies, 147 were indicated as either "interested" or "maybe interested," representing 61.25 percent of responses, whereas 93

were indicated as “not interested” or “doesn’t apply,” representing 38.75 percent of responses.

These results can be further contextualized in terms of specific technologies and in relation with many residents’ preferences for conventional water infrastructure. With respect to the latter, conventional water infrastructure was almost, but not quite, universally desired. Sixteen residents indicated that they were “interested” in conventional water infrastructure. One indicated that she was “interested” in the infrastructure but that, at the same time, it “didn’t apply” in her remote location. And one resident indicated that he was not interested in conventional water infrastructure, but preferred living without any dependency on or connection to a water utility. Finally, one resident in Cochran expressed mixed emotions, stating he did not want water infrastructure for himself, because he perceived that it would likely hike his property taxes; however, when he considered families in his community, he felt that they deserved conventional water infrastructure. For that reason, he asked that I mark that he was “interested” in conventional water infrastructure. Otherwise, however, most residents made it clear that they would prefer conventional water and sewer access to the services provided by soft path elements, especially residents of Cochran. This is likely because in Cochran a water infrastructure project seems more feasible, given that a water line terminates less than .25 miles from the neighborhood and houses are not scattered over a wide geography as they are in Las Pampas. In general, the six Cochran residents surveyed considered the questions in a frame of mind that soft path technologies were a next-best option in the event that conventional water infrastructure would not be provided.

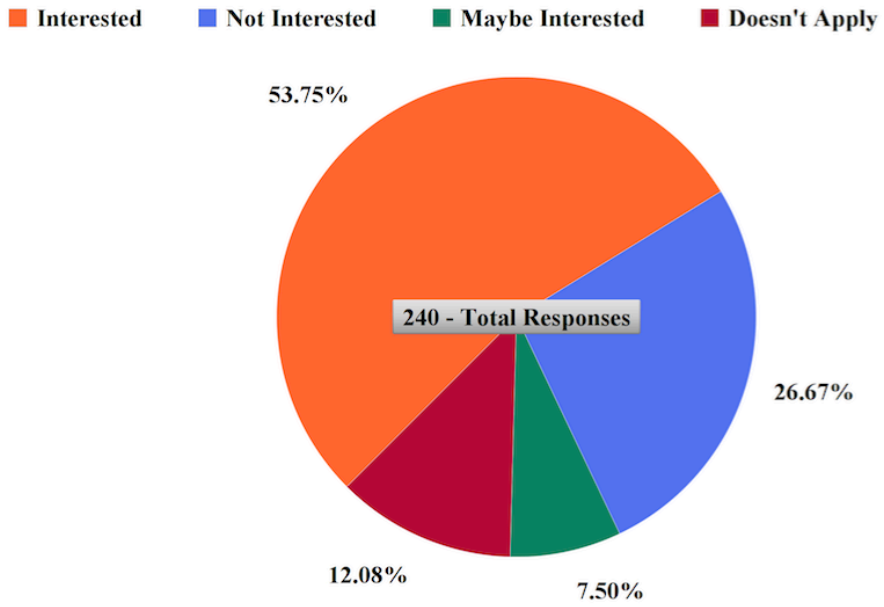

Figure 6: Residents' interests in soft path technologies and practices. This graph displays the percentages of respondents' answers, out of 240 total responses, indicating whether they were "interested," "not interested", "maybe interested", or the strategy "doesn't apply."

Survey results also indicated more general and widespread interests in some soft path strategies over others (see Residents response charts below). The most popular soft path strategy among *colonias* residents surveyed was the under-the-sink filter, for which 15 residents expressed interest and only one expressed being not interested. Conversely, 9 residents expressed being "not interested" in composting toilets and/or sink-to-toilet greywater configurations, which tied for the two technologies that garnered the most residents expressly stating they were not interested. Even so, five residents mentioned they would be interested in a composting toilet to save on water consumption and one resident already used a composting toilet. Four said the same for hooking their bathroom sinks up to their toilets to reuse water and save on supply, and two residents in Las Pampas used a version of this strategy already (bucketing water from their sinks to their toilets after washing dishes). Other soft-path technologies and techniques that proved popular among *colonias* residents were rainwater harvesting, installing low-volume sink aerators,

replacing current showerheads with low-volume showerheads, and using micro-sewage treatment plants, which are packaged plants that treat sewage at community or household levels and return treated water for non-potable reuse. For each of these technologies, 12 residents indicated they would be interested in implementing them. For rainwater harvesting and low-volume shower heads, only one resident expressly stated that he or she was not interested, and nobody indicated being not interested in low-volume sink aerators (although one resident said sink aerators do not apply in her situation, because she did not own a sink with running water). For micro-sewage treatment and re-use, four residents indicated they might be interested, but simultaneously had a hard time envisioning how such a system could be installed in their neighborhood or homes, and, for that reason, indicated that such a system "doesn't apply." Finally, only 3 people expressed being "not interested" in low-flush or dual-flush toilets, versus nine residents indicating they would be interested, five already using such toilets, and one stating those toilets wouldn't apply (because she took pride in her composting-toilet system).

Taking a quantitative overview of the data, then, *colonias* residents indicated a clear interest in soft path technologies and practices. Some of these strategies stood out as more potentially interesting and helpful than others, namely, under-the-sink filters, rainwater harvesting, low-volume sink aerators, low-volume showerheads, and micro-sewage treatment and reuse plants. In Cochran especially, residents emphasized that they would much prefer conventional water infrastructure; however, in both Cochran and Las Pampas, residents made it clear that many of the soft-path techniques and strategies could be helpful in their situations. To understand how and why this is so, we will now turn to a qualitative analysis of the soft path in both communities, drawn from interviews, observations, and extended discussions that took place during surveys.

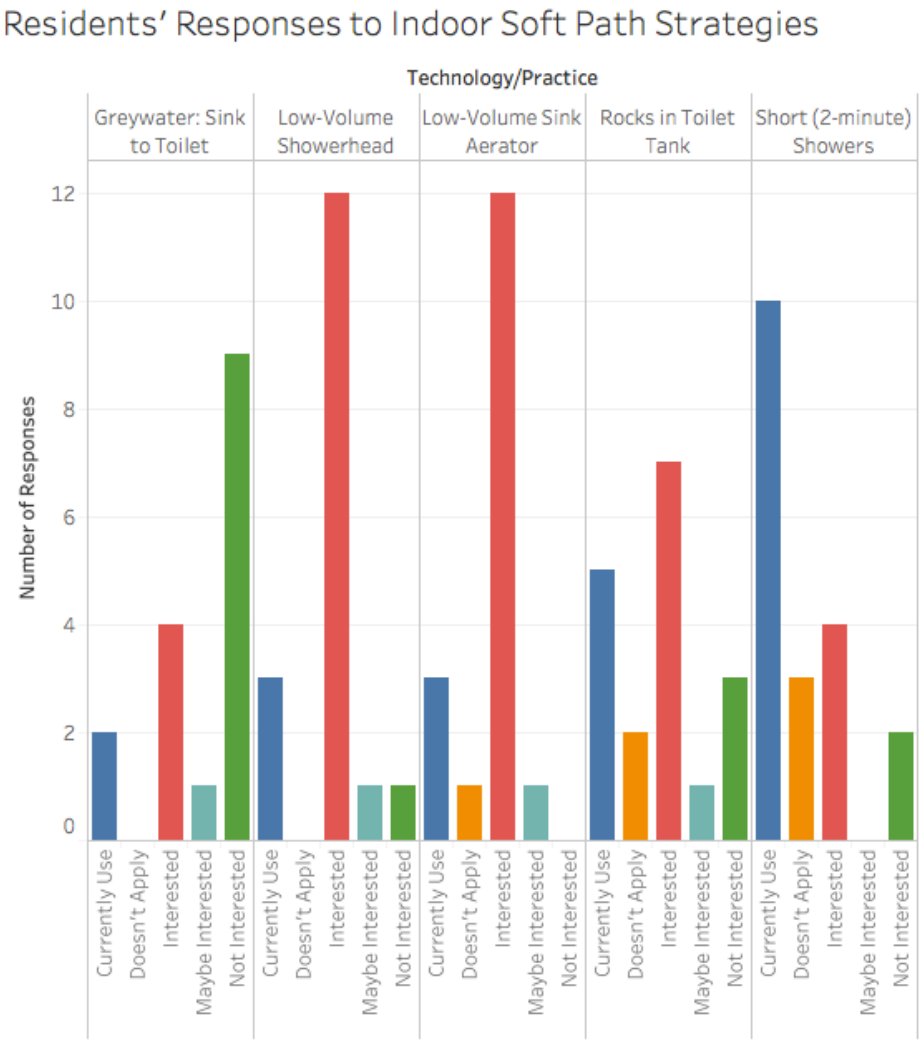

Figure 7: Residents responses to indoor soft path strategies.

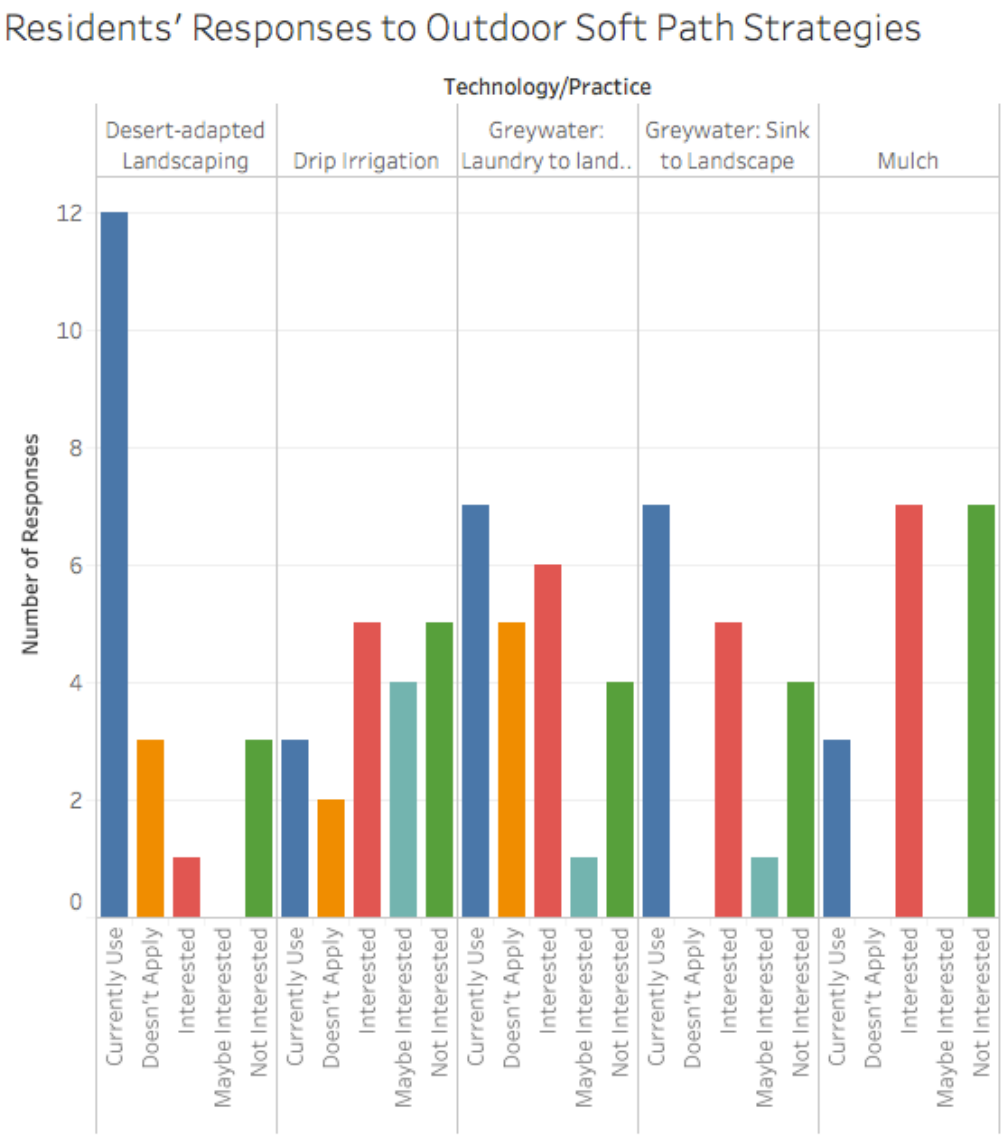

Figure 8: Residents responses to outdoor soft path strategies.

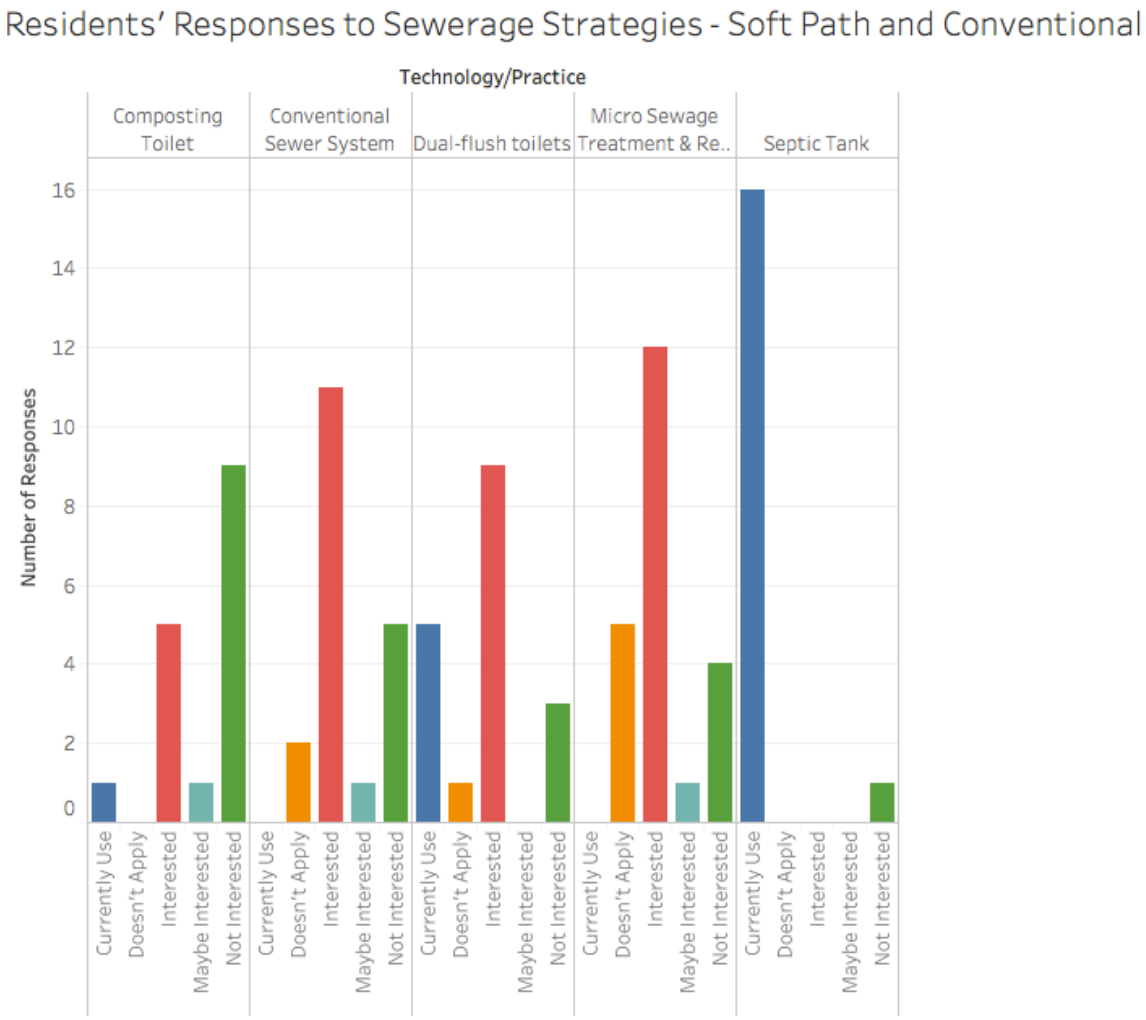

Figure 9: Residents responses to soft path and conventional sewerage strategies.

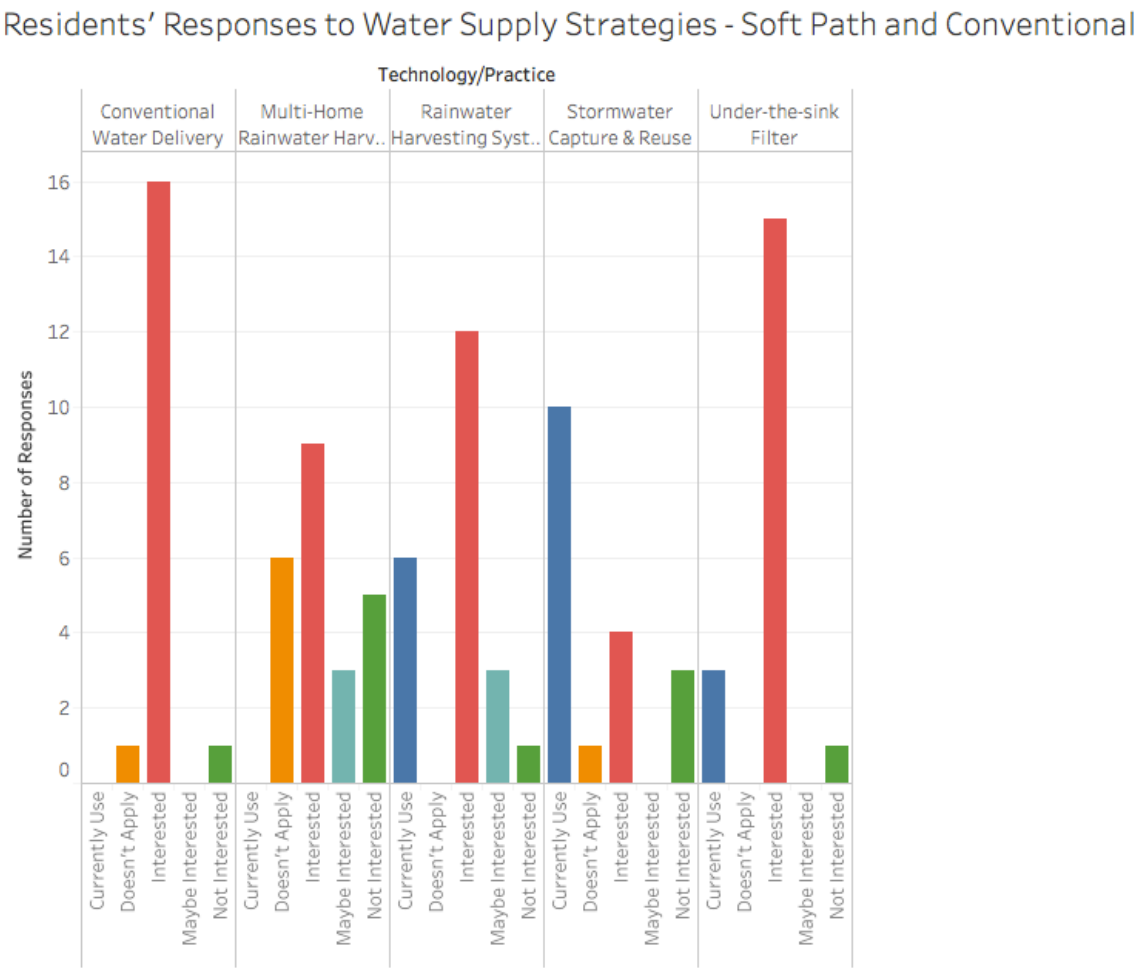

Figure 10: Residents responses to soft path and conventional water supply strategies.

Rainwater harvesting, point-of-use filters, and diffusion of innovation

Prior to my involvement in Las Pampas, students and faculty from the Center for Environmental Resource Management and Engineers for a Sustainable World had installed rainwater harvesting systems on the homes of Vicente Jimenez and Santiago Ramirez (see Figure 9). As rainwater harvesting represents a key soft-path strategy, these two residences offered an opportunity to understand homeowners' perceptions and water-usage patterns *ex post facto* a system's installation.

Figure 11 depicts a rainwater harvesting system at the home of Las Pampas resident Santiago Ramirez, whose tank capacity for harvested rainwater was about 2,500 gallons (not all of his tanks are pictured here).

Both señores Jimenez and Ramirez lived on little ranches (*ranchitos*) adjacent to Highway 67, roughly eight miles north of Presidio, Texas. At each property, the men grew a variety of trees and bushes, such as pomegranates, figs, peaches, rose bushes, palo verdes, yuccas, ocotillos, mesquite, and *guisache*. Both families also practiced animal husbandry, keeping sheep, hens, chickens, and dogs. Señor Ramirez grew a variety of herbs and vegetables for his family in a small garden beside his home, and, during wet years, he planted a small plot of land with hay for his sheep (fallow during my visits). Like all Las Pampas residents, prior to receiving the rainwater-harvesting systems, *señores* Jimenez and Ramirez relied exclusively on hauling water from Presidio. Both men reported spending significant time and money (mostly on gasoline) taking trips to and from Presidio to haul water. *Señor* Ramirez, for instance, estimated he took between three and six trips each week to haul water. During my visit, he told me his rainwater harvesting system, which initially had capacity for about 2,275 gallons, helped reduce those trips, thus saving him time and money. “When it rains a lot, I have a lot of water,” *Señor* Ramirez said. “It has reduced the number of trips.” Mr. Ramirez did not trust hauled water for potable uses. Instead, he and his wife drank and cooked with water from five-gallon jugs

purchased at the water-vending machine in Presidio. He also dedicated two tanks to non-potable, indoor household uses, pumping this hauled water into his home for washing dishes, showering, and flushing toilets. His rainwater-harvesting system was separated from this indoor-water tank system and designated solely for outside uses, such as watering animals, trees, and his garden. These last three items used large quantities of water, he explained, though he could not estimate a quantity, primarily because it fluctuated with the seasons and his plantings. However, when his rain tanks contained water, his estimated three to six weekly trips were reduced to as little as one, he said, which is all he and his wife needed to supply adequate water for their indoor usage.

In recent months, *Señor* Ramirez explained, the town of Presidio had told people in the area that they were planning to relocate the in-town spigot where Las Pampas residents filled their tanks with municipal water. Rumor had it that they intended to move the spigot to the landfill, he said, which was much farther from his *ranchito* than the tap's present location. The town also planned to hire a "secretary" to monitor the spigot. Pondering the town's plans to move and monitor the spigot, *Señor* Ramirez lamented: "It's not going to be convenient because it's far and expensive. The secretary will charge us a lot. They're going to pay the secretary $15 per hour. So, it will be expensive. Another thing: They're going to tell us which hours we can go and take the water." In light of these pending developments, he was glad to have the rainwater-harvesting system. "If it rains, we won't have to do this, but it has to rain," he said, adding: "They (the tanks) help us a lot, because we have more water. It gives us more control over our water."

Despite being "content" and "comfortable" with the rainwater-harvesting system, *Señor* Ramirez expressed one limitation: a lack of rainfall. In the West Texas region, he said, it "almost never rains." Each year was slightly different, but generally the rainy season began in July and

lasted through September. That left long stretches of time when his tanks were empty. When it did rain, however, he said it rained hard. “These tanks, and those, when there’s a lot of rain, the water runs out of the tanks,” he said. “They fill and the water falls out.” He could not estimate how long his tanks lasted when full because he had only had them for one year. They were dry for the first half of the year, except for one small rain in February, but filled several times in the months from June to December. Even with the scant-rainfall limitation, he said the tanks “have helped us much.” He was also interested in expanding his tank capacity to store more water so that it could be stretched out during periods between infrequent rainstorms. Several months later, students and faculty from CERM returned to his home and added another tank, bringing his total capacity to about 2,500 gallons. During that visit, *Señor* Ramirez said, “I hope that for all of the people who need these, they can put them in.”

Señor Jimenez expressed similar sentiments regarding his rainwater-harvesting system. His *ranchito* was planted in numerous trees, many of which traced the border of his property. He took two or three water-hauling trips to Presidio per week. Much of his water went to maintaining his property’s trees, which consumed about 700 gallons per watering, he explained. Like *Señor* Ramirez, *Señor* Jimenez said his rainwater harvesting system cut down on the number of trips he took, thus saving time and money. “These tanks help me,” he said. “They save me gasoline.” After a good rain, when his entire tank system was full, he estimated they contain water for about 15 days’ worth of use. “If it would rain, it would help me even more,” he said. “Two times a year, sometimes it rains here. Thank God it is raining.” When I asked him if he would recommend rainwater harvesting for people in situations similar to his own, he said that he would, “Because one saves. When it rains, it saves time coming and going. It’s very good. Yes, why not?”

Interestingly, both *señores* Jimenez and Ramirez stated that other residents in Las Pampas had taken an interest in their rainwater-harvesting systems. Maria Jimenez, Vicente Jimenez's wife, said, "Everyone has liked it." And *Señor* Ramirez mentioned that, "Everyone wants one. The small house nearby, they want one. The ones over there want one." These comments indicate a diffusion of innovations that I observed in Las Pampas, where residents took notice of these two rainwater-harvesting systems and sought similar systems for their own homes. Diffusion of innovation (Rogers 1962) seeks to explain why or how a product picks up momentum and spreads throughout a given population or social system. Starting with just a few members of the population, the product, idea, or behavior is observed, desired, and adopted by others until it becomes widespread and ubiquitous within the society. The key to this "diffusion" is that members of the social system have to perceive that the product, idea, or behavior is useful, new, and innovative (Rogers 1962). In Las Pampas, this spreading and adoption began happening naturally, without advertising or outreach, which further indicates that rainwater harvesting is perceived as a useful strategy for increasing water supply among *colonias* households lacking water access. In all, three Las Pampas residents reached out to CERM asking for help installing rainwater-harvesting systems. One resident, Frederico Gutierrez (mentioned briefly in an earlier part of this thesis), asked CERM to simply provide him with tanks. Once he received the tanks, he installed the rainwater-harvesting system himself. Two other Las Pampas residents observed the rainwater-harvesting systems, or heard about the work that was done, and called asking if students could install systems on their own homes.

The moves by Las Pampas residents to secure rainwater-harvesting installations on their own homes are clear examples of innovations beginning to take hold and spreading throughout a population. Much like in Las Pampas with rainwater harvesting, I witnessed a similar diffusion

in Cochran with point-of-use filters. A UTEP program with which I was not affiliated had installed point-of-use filters in at least three Cochran homes. I did not have prior knowledge that other university researchers had been working in Cochran, but the existence of these filters in peoples' homes offered another opportunity to record data on residents' perceptions after the fact of installation. Two of the three Cochran residents I encountered mentioned that they still used and liked the filters. I visited the household of Antonio Flores in March of 2019. They had been using the filter since December. Before, they had relied on water bottles and 5-gallon jugs for their drinking water. However, since December, they had switched to filtered water for drinking and cooking. They found the filter convenient and estimated that they saved money, because they no longer had to purchase expensive potable water. Despite these positives, the Flores household expressed having some confusion with the filter's ongoing care and maintenance. For example, they asked me for advice on the device's maintenance. "When do we need to clean the filter?" "How do we know when it is dirty?" "How do we replace the filters?" These questions highlight one of the chief concerns associated with decentralized, point-of-use treatment, which is that it relies on the consistent monitoring and application of the technology by the end-user, whereas centralized treatment systems routinely perform tasks such as treatment and repairs for dispersed users throughout their networks. One potential workaround for such issues would be for agencies or utilities who install soft-path technologies to provide routinized maintenance and upkeep, along with training to the residents.

The second Cochran resident who had received an under-the-sink filter was Margarita Hernández. Like *Señor* Flores, *Señora* Hernández said that she and her family had adopted their water-usage patterns to accommodate the filter. No longer did they purchase five-gallon jugs or bottled water to drink, but instead they relied on water treated by the filter. Moreover, *Señora*

Hernández's comments demonstrated how soft path technologies had partially alleviated more than one water-borne burden. "It is very helpful," she said of the filter. "It helps us a lot, at least with carrying five-gallon jugs of water to drink. Those are very heavy." She went on to state the filter helped them with "not spending more money." Prior to the filter's installation, she estimated that the family spent $20-$30 a week on bottled water, or as much as $120 a month. *Señora* Hernández emphatically made the case that the filter helped reduce those costs. "Believe me, it does help with not getting to buy any water for drinking." For *Señora* Hernández, a grandmother in a household of 12, neither of these were incidental burdens. For one, her family relied almost exclusively on hauling their own water because the water-trucking company charged $75 per load, a cost which her family could not bear. However, they paid for this not in dollars but in stress, strain, and time. As detailed previously, the family spent an estimated 24 hours a week hauling water. Moreover, *Señora* Hernández said the family's old water-hauling truck verged on breaking down, an inevitable reality that she anticipated with anxiety, because, when the truck broke down, as it did periodically, they would lose their lifeline to self-hauled water and would have to resort to expensive water brought by *la pipa.* These burdens, then—cost, time, and stress in maintaining reliable access to water—were all interwoven in the mind of *Señora* Hernández, who was loath to pay for more water but fatigued by constantly having to haul it:

> For me, when I have to do that (pay for hauled water)—it's not twice a month, it's three times a month. My son has five kids. Right now, he didn't have a job. And I couldn't tell him no. I couldn't tell him no, because I didn't want him on the street with his kids or in a shelter. So, I said, 'You know, right now it is.' He barely started a job. But still, if I have

to buy the water, it's going to be like three times a month or four times. Now, with the heat, I have to use the air conditioning, and it's going to use more water, too.

For these intermixed reasons, *Señora* Hernández was very happy to have a filter that reduced the amount of money she spent on water and the strain on her back from carrying the five-gallon jugs into her home. Despite these positive reactions to the filter, one Cochran resident who had received a filter said he disliked the device so much that he dismantled it. Juan Garcia said that he was excited to get the filter at first. However, after he installed it, he noticed that the tank beside his home was draining much faster than normal. With his water costs so high—*Señor* Garcia paid $75 per load of water—he took very seriously the need to conserve. *Señor* Garcia told me that he noticed his under-the-sink filter, in the process of purifying water, ejected a large quantity of water every time it was used. For that reason, he removed his filter and went back to buying bottled water. His experience makes clear that any filter installed should not increase the volume of water flushed away, especially when residents already pay exorbitant costs for water.

Finally, despite this one potential caveat, Cochran residents who hadn't received filters expressed a desire for the filters as a result of knowing that their neighbors had received them. This diffusion of innovations occurred in two households, where residents mentioned that their neighbors had received under-the-sink filters and said that they wanted them, too. One resident in particular, Rebecca Meléndez, mentioned that she had heard her neighbors received the filters. When she spoke with the researchers doing the installations, she offered them her data so that they could come back and install one under her sink. She told me she hoped that they would return and install a filter, because it seemed like a device that could help her save money on potable water.

These conversations in Las Pampas and Cochran, wherein residents drew a link between hearing about or observing a soft path technology and a consequent desire to adopt said technology, offer early evidence for a diffusion of innovations among communities receiving certain soft-path technologies. Regarding rainwater harvesting in Las Pampas, after two residents received systems, one resident took the initiative to install his own, and two other residents proactively contacted CERM to request similar systems on their homes. Additionally, the two residents who had already received the systems told me not only that they themselves would recommend rainwater harvesting systems for people in situations similar to their own, but that many of their neighbors had told them they liked their systems and wanted their own. In the case of the under-the-sink filters, the potential for this diffusion of innovations was a bit more mixed, especially because one of three residents who had already received a filter removed it. However, two residents were very happy with the filters and said they saved time and money and reduced stress. Furthermore, two additional residents expressed a desire to have similar filters installed, and these desires derived not from my survey questions, but rather from their prior knowledge that such filters had been installed in nearby homes. Furthermore, setting aside the diffusion of innovations theory, it is worth recalling that under-the-sink filters were the soft-path technology for which most residents indicated an interest during surveys (15 of 17 residents interviewed were interested in having an under-the-sink filter installed at their homes).

Based on this evidence, I argue that these are early indications of a diffusion of innovations that could take place with certain soft path technologies in *colonias* without adequate water services. Allowing that these cases are limited to the number of people interviewed for this study, the fact that residents desired or proactively sought point of use filters and rainwater harvesting systems after hearing about them or observing them in their communities speaks to

the utility *colonias* residents perceive in such technologies. These data bode well for the adoptability of soft-path technologies. Where diffusion of innovations occurs naturally, it can generally be said that the product, behavior, or idea is fitting or worthwhile (Rogers 1962). As my data attest, rainwater harvesting and under-the-sink filters solve problems for *colonias* residents in that they reduce the amount of money and time spent obtaining water, and even indirectly cut back on stress. For these reasons, these soft path technologies demonstrate early potential for adoption among *colonias* residents lacking water access.

3.4.1: Soft Path Funds of knowledge

In the previous section, we caught a glimpse of how soft path ideas and technologies show potential for alleviating water-insecurity burdens with the comments and observations made by *señores* Jimenez and Ramirez (rainwater harvesting) as well as Señora Hernández (point of use filter). This glimpse was afforded by way of these technologies being installed on their homes by organizations outside of their communities. However, in many cases, residents already used soft-path strategies on their own. In this section, I posit that these already in-place uses of soft-path strategies represent the evolution of funds of knowledge around water. Since these funds of knowledge already exist, I argue that they represent an overlooked asset or resource that could leverage additional soft-path strategies in such a way that they meaningfully augment residents' water situations.

The "funds-of-knowledge" theory was first developed in the context of schools, classrooms, and education, where Vélez-Ibáñez and Greenberg (1992) noticed that teachers around Tucson, Arizona, were neglecting certain cultural ways of knowing that were socially, culturally, and cognitively complex. By failing to recognize these bodies of knowledge, Vélez-Ibáñez and Greenberg (1992) argued, schools, teachers, and the education system in general were

failing to recognize a crucial resource that could be harnessed to advance students' productive development. Funds of knowledge can thus be understood as abilities, assets, and bodies of knowledge that adapt and evolve among context-specific cultures. To explain what they meant by funds of knowledge, Vélez-Ibáñez and Greenberg (1992) related them to Wolf's (1966) views of household economy. In the household, Wolf distinguished numerous funds upon which households draw in their material struggles to stay afloat: "caloric funds, funds of rent, replacement funds, ceremonial funds, social funds." These funds, according to Vélez-Ibáñez and Greenberg (1992), entailed,

> wider sets of activities requiring specific strategic bodies of essential information that households need to maintain their well-being. If we define such funds as those bodies of knowledge of strategic importance to households, then we may ask such pertinent questions as How were such assemblages historically formed? How variable are they? How are they transformed as they move from one context to another? How are they learned and transmitted? How are they socially distributed?

Along those lines, I present funds of knowledge related to water and soft path strategies, which were elicited during interviews, surveys, and observations in low-income Mexican and Mexican-American communities who lacked reliable access to water and sewage. Much like Vélez-Ibáñez and Greenberg did with cultural knowledge in the context of schools, I argue here that these funds of knowledge represent an asset and resource that could be grasped to tap into the potential of soft-path strategies for alleviating water burdens in *colonias* where conventional water infrastructure projects are unlikely, owing to small population size, isolation, and remoteness. After making that argument, and demonstrating results to its effect, I'll make my final contention that, by utilizing these funds of knowledge and grafting them together with

certain soft path techniques and strategies, public water utilities and/or funding agencies could alleviate substantial water burdens, and, in turn, free up human capabilities in low-income *colonias* that still lack water and sewer access.

To begin, numerous indications during soft path surveys demonstrated that residents already utilize soft path strategies to either conserve or increase water from a decentralized supply source. Considering 18 different soft path practices and technologies (leaving off non-soft-path questions, namely the three inquiring about conventional sewer, conventional water supply, and septic tanks), the 17 residents surveyed indicated 80 times that they already used the strategy in question. That these strategies were already in use indicates existing funds of knowledge because such practices and technologies would not likely be utilized if the resident were not interested in reducing water use or increasing supply via a decentralized method, like rainwater harvesting. As it happens, conserving water and gathering new supplies of water represent key soft-path principles. Meanwhile, residents demonstrated where they had already devised strategies of their own to meet these two principles. The soft-path strategies most frequently indicated as already being in use were two-minute, or very short, showers (10), only using desert-adapted landscaping (12), and storm-water capture and reuse (10). These last two are interesting because they show how residents are aware that water usage outside of the home constitutes a large demand on their water budgets. By only landscaping with plants that are suited to desert climates, residents avoided the necessity of having to use extra water to keep non-native species alive. To note, some residents reported only growing desert plants out of plain necessity. For example, "We only use plants that don't take too much water. If we try to put other plants, they'll just die, because we don't have water here." Other residents, however, such Las Pampas resident Joaquin Jimenez, demonstrated more complex thinking about the plants

they chose to include in their landscapes. “Yes, we do this (only plant desert-adapted trees and plants.) We have mesquite trees,” he explained. “And the guisache. That’s what I have over there in the trailer. We’re going to try planting these, because some of my trees have burned in the sun. The mesquite is the best tree for here. They survive the best.” Only planting desert-adapted landscaping is a soft-path strategy because the main criteria for selecting a plant is its ability to survive without life-support from supplemental water; this, then, is a means for conserving water, since no additional water is needed for the desert-adapted plant’s survival. Not all residents put this strategy into place, as several said that they preferred to have ornamental trees, even if those trees used extra water. Nevertheless, in general, residents in both Las Pampas and Cochran understood this concept well in large part because it was a necessity when water was so expensive and difficult to come by.

Likewise, many residents (10) were adept at shaping their landscapes in such a way that took advantage of rain in the rare events that it did fall. This method, known as stormwater capture and reuse, advocates for digging swales, berms, ditches, and tree wells that slow, spread, and sink stormwater as it runs across one’s property (Figure 10). For example, in Cochran, one mother showed me how she had dug little *canalitos*, or canals, to capture stormwater as it came off the paved road. These canals directed the stormwater to her trees. Likewise, in Las Pampas several residents showed me how they dug trenches along the down-sloping edge of their properties to retain water during rainstorms. Joaquin Jimenez expressed that he captured rainwater, but that it had a minimal impact on his plants: “Yes, we do this,” he said. “I have around the trees, tree wells. But what happens here, it rains, the next day, it fills, the next, it’s gone. This is very dry land here, so it soaks up the water very much. So, this helps, but not much.” His brother, Vicente Jimenez, who lived in a *ranchito* nearby, also captured rainwater as

it flooded across his property. He explained that during a hard rain the water could run six inches deep across the surface of his land. The way he saw it, he wanted to collect as much of this water as possible for use on his garden and trees. “I have little ditches that go to all the trees,” he explained. “Water cascades from tree to tree. Yes, I collect a lot of water.”

Figure 12: Tree wells, berms, and basins around trees demonstrate how residents in Las Pampas shaped their landscape to capture stormwater and retain water around their trees, a soft path strategy known as stormwater capture and reuse.

Beyond desert-adapted landscaping and stormwater capture, residents deployed soft-path funds of knowledge in a number of water-saving and reusing techniques, all of which demonstrate that residents were already acutely aware of the relationship between their water demand and budgets. This is unsurprising, of course, given water’s high costs for colonias residents, yet it represents a soft-path principle that is all too often lost on urban populations where water comes in easy profusion. For example, seven residents routed their sinks and laundry machines to trees or gardens outside of their homes, a quintessential soft path strategy. In this way, residents could stretch their water resources by using the same water twice—once to wash their dishes or clothes, and then again to water their plants. Señora Hernández, from Cochran, had devised a system whereby she washed her first load of clothes, re-used the same

water by ladling it from a drum *back into* the laundry machine to wash a second load of clothes, and finally dispensed the water, not to her septic tank, but to her trees—thereby using the same supply of water for three separate uses. Similarly, six residents already used some version of rainwater harvesting—most often by simply capturing water running off their roofs in buckets; five residents had installed dual-flush or low-flush toilets; and five residents had limited their toilet-flush volume informally, either by adjusting the float or putting rocks in the toilet tank to displace, and therefore consume less, water. Residents' reasons for adopting these technologies and strategies were almost invariably connected to their acute understanding of the costs of water and the difficulties they had to endure to obtain it. Talking about his laundry-to-landscape system, for example, one resident put a fine point on the relationship between water costs and conservation: "You've got to think, when you don't have the means, I'm not just going to throw this water away. I don't want to fill up my septic tank. I'm going to put it on my trees." Generally, in cities where people need do little more than turn on a faucet to retrieve water, water goes as easily as it comes. But this was not true in Cochran and Las Pampas, where residents demonstrated time and again a proclivity for conserving water. This proclivity originates in necessity; however, the soft path could leverage these extant funds of knowledge which residents have developed in water-insecure environments, thereby making a virtue of necessity.

In addition to direct observations and conversations about soft-path funds of knowledge, I observed several other skills and practices among *colonias* residents, which, I submit, could indirectly bolster the case for the soft path's applicability in *colonias*. Here I argue that certain funds of knowledge interlink with those that, by inference, could contribute to the successful implementation of soft-path strategies. For example, numerous residents had built their own homes, maintained their own household-water systems, and designed their own landscapes and

planted their own trees. These bodies of knowledge cluster under what Ward (1999) termed *colonias* residents' "self-help" mentalities, a scrappy admixture of resourcefulness, ingenuity, and resilience by which residents continually deploy creativity and agency in bettering their lives and communities amidst difficult circumstances. Again, Señora Hernández was perspicacious in her understanding of the self-help lifestyles by which she and her family got by:

> Just like they say, we have to do with what we have. We don't have the luxury of hiring people. That's the same reason why we bought so far (away from the city). There was nothing close by or anything. So, we said, 'OK, if you have money, you can pay to live in the city. You can pay to have someone (build your home) for you.' When you're limited, you have to make do with what's available.

But how might self-help relate to the soft path to water? In the field, I witnessed numerous instances where self-help skills could be transferable to maintaining soft-path techniques and technologies. For example, when I asked Santiago Ramirez if he needed any maintenance on his rainwater harvesting system, he said, "We had some little problems with the gutters, but I was able to fix it. This canal, instead of going one way, it went the other. But I got up there and adjusted it, and I left it good." Elsewhere in Las Pampas, Dave Green showed me how he had rigged a pump to lift water onto a platform where a Rotoplas tank sat towering high above his home. Mr. Green explained that he pumped the water up there so it would gravity-feed into his home. He then showed me how he placed barrels at the corners of his roof to collect rain, and how he had built and plumbed his entire home. Las Pampas resident Joaquin Jimenez, brother to Vicente Jimenez, also pumped water into a tank high above his roof so that it would gravity feed into his home. Joaquin Jimenez demonstrated a complex understanding of annual rainfall patterns and rainwater harvesting, stating that he would not want a rainwater harvesting

tank unless it was several thousand gallons and made of thick black plastic. When I asked him why, we shared the following exchange:

CT: The tanks that you have, are they originally black, or do you paint them?

JJ: We paint them.

CT: Oh, ok.

JJ: Yes, if we paint them, then it keeps the sun from growing an algae that turns the water bad. Yes, this is one thing. But the other thing is, a tank like that, the sun eats away at the paint. We have a very strong sunlight here. It's very harsh. When the sun hits the tanks, it destroys the paint. So, look, if you're going to bring me a rainwater tank, I need a tank that is *originally* black. It will endure many years. They're the best—not blue, not white, but *black*! These other tanks aren't worth the time. Also, don't bring me any of these little tanks. They're not worth the pain (*No vale la peina*).

These remarks were made in good humor, and we both shared a laugh. Then, I asked him something to the effect of why he wanted such a large tank, to which he responded:

Look, this would interest me, but only if there were large tanks. They would have to be very large tanks. Because, look, it rains a lot, but only once or twice. Also, it would have to be a black tank. The little white tanks don't last. Two, three years, you have to replace them. So, it's not worth the hassle if it's not a big black tank.

In all these instances, residents demonstrated funds of knowledge that could either directly or indirectly be useful in the deployment of decentralized soft-path strategies, which would likely require more involvement and know-how from householders than typical central-infrastructure solutions. Since *colonias* residents have taken the time to get to know their homes, their water systems, their landscapes, and their plumbing systems—to know them in an intimate

way that only comes from building, tinkering, and working on them themselves—I submit that the self-help mentality constitutes a particular knowledge fund that could leverage implementation of soft-path strategies. These indirect knowledge funds couple with direct knowledge funds in soft-path strategies detailed above to strengthen the case for the soft path as an alternative to doing nothing in *colonias* where conventional water access seems a very remote possibility.

Up to this point, we have unpacked the soft-path survey results, learning that residents, on the whole, expressed a greater interest than not for various soft path ideas and strategies, with more popular interests in point-of-use filters, rainwater harvesting, low-volume sink aerators, low-volume showerheads, and micro-sewage treatment plants. We have seen how rainwater-harvesting systems and under-the-sink filters fit in with residents' lives in a few key case studies, noting that, with the exception of one filter in Cochran Mobile Park, rainwater harvesting and point-of-use filters were embraced by residents, who stated they were helpful in saving time and money and reducing stress. Moreover, we witnessed a diffusion of innovation that began to occur, when, in both field sites, other residents took notice of these technologies and sought them for their own homes. Such a diffusion, I argued, bodes well for the adoption of soft-path techniques, because it occurred naturally and thus indicates an inclination among residents in small, remote *colonias* for certain soft-path strategies. Next, we examined funds of knowledge that already evolved in *colonias* households—tricks, skills, and techniques by which residents conserved water, reused water, and sought more water supply through decentralized means—all of which fit within soft path principles. These funds, I argued, evolved out of the necessities inherent in living in landscapes and communities without water access, places and spaces where water is conserved because it is costly and hard to come by. Lastly, we discussed the presence of

funds of knowledge that could intersect with soft path strategies, such as complex understandings of rainfall patterns and how those relate to tank sizes and self-help mentalities that have developed around skills in building, plumbing, gravity-feeding water, and maintenance.

So far in this thesis, I have argued that the soft path's utility is couched in an understanding that it represents an alternative to conventional water infrastructure in communities where the other alternative has historically and presently been doing nothing. These arguments summarized here demonstrate a strong case for why this is so. We have hinted at the idea that the soft path can free up other capabilities as well. However, this is an important point, one that merits fleshing out. So, to make my final argument, we will now directly investigate evidence that speaks to the soft path's potential as a tool for "development as freedom" (Sen 1999), beginning with the remarkable story of Suzette Shapiro and her son Sammy. Her story demonstrates very clearly how soft path strategies could intertwine with funds of knowledge to free up human capabilities, and her experience moreover punctuates the amazing resiliency and resourcefulness deployed by *colonias* residents in the face of difficult circumstances. This being the case, I will now share her ethnographic profile in some detail, before embarking on a wider discussion of the synergistic leveraging of capabilities that could occur if soft path strategies were more widely utilized in remote, isolated *colonias* lacking water and sewer services.

3.4.2: Leveraging funds of knowledge to free up human capabilities

Figure 13: The homestead of Suzette and Sammy Shapiro.

In November of 2016, Suzette and Sammy Shapiro loaded all their belongings into a rusted van she bought for $900 on Craigslist and drove some 1,460 miles from Chicago, Illinois, to their new home, a 10-acre piece of land outside of Presidio, Texas. When they came, Ms. Shapiro knew next to nothing about West Texas, and even less about Presidio; she had never even seen the land.

But times had been hard in Chicago. Her home had been foreclosed on, and she and Sammy, her autistic son, had been evicted. They were in and out of homeless shelters and Ms. Shapiro was desperate for change. “I wanted to get out of the rat race,” Mrs. Shapiro told me. “At the time, I was on Ebay. I just came across 10 acres being auctioned off. I wasn’t really even looking for land. But the starting bid was a dollar. I didn’t join the auction until the last 30 minutes.”

Ms. Shapiro placed a bid for $850. That last-minute decision, made just before the auction’s close, proved fateful. “Somebody outbid me,” she explained. “But they backed out.”

With that, plus a $500 processing fee, Ms. Shapiro found herself the proud owner of a 10-acre property in Las Pampas, Texas. She and Sammy took four days to make the drive. Upon arriving, however, they encountered their first snag: “I had trouble finding the property,” Ms. Shaprio explained. “I don’t think my GPS was sophisticated enough. Whenever we got near to this area, my GPS would just go blank. I ended up going to city hall downtown. The man there told me to meet somebody to help me find the property, but that guy couldn’t help me find the property.”

Her and Sammy set up “basecamp” in the high desert, at a spot across from a ravine where her best guess told her the property was located, and lived for several days in the van. As it turned out, she and Sammy were on a rancher’s property. That rancher gave her a call with a mind to run her off, she said, but, when she explained to the man her situation, he decided to help her out. “He started apologizing. He was treating me like a squatter and then realized he was wrong and felt bad about it. I said, ‘You know what...I don’t want to be on nobody’s property. I’m trying to find my own property. If you help me find my property, everything is fine.’” She gave him the GPS coordinates, and he helped get her and Sammy to the land.

Ms. Shapiro’s first order of business was to go about turning a dry patch of desert into a home. She and Sammy had no electricity, no water; more importantly, they had no shelter. When Sammy received his next Supplemental Security Income check, she bought a prefabricated structure. This structure was trucked out to her property and dropped. Ms. Shapiro went about outfitting the structure, which from the outside looks like a small metal barn, into a home, setting a bed into a loft, dragging in couches, installing shelves and countertops, stapling mesh fabric around her little porch. Despite some early hardships, things were going well.

But then there was the road. Her nascent homestead sat a full 12 miles away from the nearest town. Three of those miles consisted of a rough-riding ranch road, rife with ravines and potholes and washouts. “The only disappointing thing is that road,” Ms. Shapiro explained. “You don’t want to deal with that every day. That’s why, when we leave the property, we make it count.”

Shortly after they arrived, Ms. Shapiro’s van bottomed out, destroying the suspension. In a place as small as Presidio, Ms. Shapiro said, good mechanics are hard to find. They used junkyard pieces to make repairs, and she had a suspicion that some men tried to take advantage of her being a woman far from home. “I think they think women are dumber around here,” she remarked. The suspension breaking down inaugurated a cascade of van troubles; first her shocks, then her transmission, then her drive shaft. Each time something broke, it would take weeks to find and order the parts, then additional weeks to repair them. All the while, she and Sammy were unable to live at their new home; they had no means of traveling back and forth across those last three miles of road, so that, even if they were to get a ride back to their property, they would have been utterly isolated and incapable of retrieving necessities like food and water. For the first few months, they rented a trailer in a trailer park. But Ms. Shaprio’s money ran out. At that point, they found themselves back in the same type of place she had hoped to escape from in Chicago: a homeless shelter.

As the saga with the van wore on, she was told she had to replace her drive shaft, because it was too short. She ordered a new drive shaft from a shop in Chicago, which took weeks to arrive. When it got there, the mechanic told her they had sent the wrong part—it was the wrong size again. “So, I called the auto shop (in Chicago), and they could hear the tears in my voice. I was frustrated. They assumed somebody had sent me the wrong drive shaft. They were very

apologetic. They said don't worry about it, Ms. Shapiro. We're going to send you the correct drive shaft."

The third drive shaft arrived weeks later. She was so excited and anxious to get the van repaired and back to her place that she could not wait for a ride; she took the shaft on-foot. "I carried the drive shaft all the way from (my friend's) house to the auto shop. I called him on the cell phone, and when he pulled up in his vehicle, I had the drive shaft leaning over my shoulder—it was taller than me—and he looks at me and he says, 'It's the wrong size again.'"

At that point, Ms. Shaprio suffered a near-breakdown. "I had measuring tape in one hand, paperwork in the other. I dropped everything and was getting ready to crawl under the van. I just couldn't understand how even the original could be the wrong size."

That's when the mechanic took another look under her van and realized that it wasn't the drive shaft that was the wrong size; rather, one of the mechanics who had repaired her suspension or transmission had physically moved her transmission, making it so the properly-sized drive shaft would not fit. "Well, these mechanics, they don't like to tell on each other. But (the mechanic) was like, 'enough is enough.' And he moved the differential back in the van to where it's supposed to be. And then me and Sammy were able to drive it."

It had been four months, but Ms. Shapiro and Sammy were finally able to move back to their home. Since that time, what she has accomplished there, all but alone in the desert far from Chicago, is nothing short of remarkable. Watching and learning from YouTube videos, she has cleared the area around her home of brush and bramble and surrounded this clearing in solar lights mounted on six-foot wooden poles. She has built an outdoor bathing station; erected another second small shelter for storage, where she plans to install a solar shower; set up an outdoor cooking station (to compliment her in-home kitchenette) where she can heat meals over

an open fire; devised a composting system for toilets and sewerage, which requires not a drop of water; and installed four solar panels, complete with wiring to a battery bank, so that she and Sammy enjoy off-the-grid electricity. “I love solar,” she explained during my visit. “I’m surprised the rest of the world hasn’t gone solar...I’ve seen some people on YouTube, and they do just fine without electricity. I don’t know how they do it. I know one couple that charges their devices with their car. But, it’s much nicer if you have some solar. And that’s one thing we have a lot of out her: sun.”

From the lows of the Chicago and Presidio homeless shelters, Ms. Shapiro has been on a quest to steadily and incrementally improve her and Sammy’s living conditions. Along this quest, she heard about the rainwater-harvesting systems installed at the homes of senores Ramirez and Jimenez. Speaking with Frederico Gutierrez, who she met at the Presidio hardware store, she retrieved the contact information for my colleagues at CERM. In this way (an example of innovations diffusing), we got in touch.

When I arrived at her home, somewhat rattled from the 20-minute drive on the rough dirt road, Ms. Shapiro explained to me that water—or lack thereof—dictated much of what she did around the home, her comings and goings, and the devices, strategies, and tools she and Sammy used to get by. For example, she had since bought an old SUV, parked near the van, which she had acquired mostly out of fear that if her van broke down again, she and Sammy would be cut off from water. Likewise, on her front porch, she stored dozens of jugs and quarts of bottled water, which she, as a rule, did not touch, for these were purchased for the sake of resilience in the case they were stranded. For her day-to-day water supply—bathing, drinking, doing dishes, etc.—she and Sammy made trips to Presidio or Marfa. Every four days, she and Sammy drove the dirt road to retrieve water. At the spigot in Presidio, she filled five-gallon painter’s buckets

for non-potable use. For drinking water, she visited the water vending machine, filling gallon jugs, and also purchased 24 packs of bottled water. In the hot months, she filled large orange coolers with ice, so that, as the ice melted, it created cool water. “Those coolers keep the ice cold for about 4 days,” she explained. “I schedule trips for when the ice melts.” She estimated she spends $12.50-$14 a week on drinking water, not counting gas to town and from town. Moreover, her son’s autism was so severe that he could not help with carrying the jugs and buckets of water, and she fretted each drive with all the weight in her van on the rough road.

For these reasons, Ms. Shapiro was always on the lookout for tricks, tips, and devices that could build resiliency into her systems for securing water. Given her remote isolation, she did not envision conventional water infrastructure as a possibility. “It would be nice,” she said, “if it’s not too expensive. But I don’t foresee it happening.” Rainwater harvesting, on the other hand, struck her as a realistic technology that could meaningfully augment her life. On this point, she was effusive:

> I really want that. It would provide us with clean, fresh, free water, and it would make us more self-reliant than we are now. I think, if you get one good rainfall, that would be a lot of water. You should see how it rains out here. If you saw how much rain we had about a week ago, it would have been enough for months, if we had a rainwater system already in place. That would have supplied us with water for, like, two months.

I asked her if she thought a rainwater harvesting system would help cut down on the number of trips she took to Presidio, to which she responded,

> Yes, definitely. Then, when we go, we wouldn’t have to haul so much water, or during that time, we wouldn’t have to haul water. We could just go to Presidio if we wanted. But

we wouldn't have to spend all that time going just for water, or going and filling up all the jugs and buckets.

Not only did Ms. Shapiro connect rainwater harvesting as a strategy to an ability to reduce trips to Presidio, which would save time, money, and strain on her van (she often referred to her van as her "lifeline"), but she also linked such a system to her funds of knowledge in resilience and off-the-grid living. Moreover, she spoke of rainwater harvesting, and other soft path strategies that could improve water quality and supply, such as under-the-sink filters, composting toilets, micro-sewage treatment and reuse, and other methods for recycling water for multiple purposes, to her personal funds of energy and attention. "Maybe if we do get some rainwater out here," she offered, "that would free up a lot of energy, and I might be able to use that freed up energy to do some gardening or something."

Reflecting on her arrival in Las Pampas, the hardships she and Sammy had endured, and the incremental path to resiliency on which they now found themselves, Ms. Gardner looked around her property and said, "I didn't know anything about any of this at the time. And we didn't have the money to get all the supplies all at once to stay out here." But piece by piece, move by move, she had marshalled the resources, energy, and capital to build an ever more comfortable home for her and her son. For her next step, she envisioned rainwater harvesting. "At any point, I'm glad to be a part of it," Ms. Shapiro said. "If we can establish a water harvesting system, whether it's this cabin or both cabins. Me and Sammy can pay for it; we just don't have the skills to do it. We can even pay for the materials."

It might be tempting to assume the Shapiros represented an outlier case among residents in *colonias*. And, in some respects, they were. They were the only African American family I encountered, and the only people to have migrated from Chicago, and were certainly the only

family who had purchased their land on Ebay. In other respects, however, their situation represented but a contemporary example of what most *colonias* families previously went through in the process of migrating, of arriving on remote pieces of unimproved land, and of being pressured to the margins as a consequence of escaping poverty cycles, seeking opportunity, and securing more stable lives. Most other families, to be sure, had been much longer established in their locations. But what they shared with the Shapiros, both at the time of their arrival and now, was resourcefulness and grit, the ability to tap into social networks, to learn how to do things on their own, to stretch their resources, and to not give up. Ms. Shapiro's story is thus an exemplary portrayal of how families dig in and survive in these remote, scattered locations all along the U.S.-Mexico border. Additionally, her story reveals the ways in which human ingenuity can couple with soft path funds of knowledge so as to free up additional capabilities.

In this analysis, I draw from Sen's approach that the chief directive of development is freedom and that freedom can be achieved through development by focusing on capabilities. That is, to the extent that a development project can free up any of a range of human capabilities, that development project is worth pursuing. Sen promulgates a wide view of both freedoms and their inverse, unfreedoms. Caught up in this wide embrace are structural freedoms, such as those garnered through education, having political voice, being positioned within a democratic system that protects freedoms of religion, press, and assembly. He speaks of social freedoms and market freedoms, freedoms enshrined in cultures, and freedoms advanced through human rights. And he also discusses the inverse of such freedoms, the unfreedoms, explaining how, for example, poverty amounts to "capability deprivation," and how famines and crises mount barriers that constrain peoples' capabilities, a word he uses almost interchangeably with freedoms. "Sometimes," writes Sen, "the lack of substantive freedoms relates directly to economic poverty,

which robs people of the freedom to satisfy hunger, or to achieve sufficient nutrition, or to obtain remedies for treatable illnesses, or the opportunity to be adequately clothed or sheltered, or to enjoy clean water or sanitary facilities." In other words, "development requires the removal of major sources of unfreedom."

With that formulation in mind, my purpose here is twofold: first, to draw attention to the fact that removing unfreedoms can be large in scale, like putting in place democratic governance, but that it can also occur (and with no less importance) at small scales, as when residents struggle with access to clean water. And my second purpose is to illuminate an emergent relationship between the soft path, funds of knowledge, and their conjoined ability to free up human capabilities in *colonias* lacking such access. Comments made by Ms. Shapiro during interviews spoke directly to this synergistic leveraging of soft path and funds of knowledge, especially when she described the soft path as having the potential to free up time, funds, and energy, as well as making her homestead more resilient—all of which, I argue, represent a freeing up of capabilities, and, ergo, freedoms. On that account, when Ms. Shapiro described the long hours spent each week hauling water, the strain to her back caused from lugging buckets of water into her home, the stress emanating from the knowledge that her van, her "lifeline," freighted with heavy loads of water, could breakdown on the rough and bumpy road, and how she spent large sums of her fixed income on water—what she was describing were the quotidian set of water-related *unfreedoms* that were stacked up against her and Sammy. Meanwhile, when she showed me and spoke of her knowledge funds around solar panels, composting toilets, off-the-grid living, and resiliency, she was describing the toolkit by which she braced against those unfreedoms. She was describing her capabilities *and* her funds of knowledge. Furthermore, these funds of knowledge graded into soft path strategies when she envisioned rainwater harvesting as

a means for getting more "clean, fresh, free water," for reducing the number of trips she made to Presidio, for cutting back on the strain to her van, for saving on the amount of money she spent on gas, and for making her homestead more self-reliant. To the extent these funds of knowledge can be further leveraged to free up various forms of "capital," be it time, energy, improved health, or money in the bank, they fit the rubric of development as freedom. They expand the realm of capabilities, potentialities, and freedoms in which Ms. Shapiro and Sammy could participate.

Importantly, while Ms. Shapiro might, in certain respects, represent an extreme case, she was not, by any means, an isolated case. That is, many others in Presidio and Las Pampas indicated the potential for this synergistic leveraging between extant funds of knowledge, soft path techniques and strategies, and their conjoined ability to free up human capabilities. When, for example, Senora Hernández communicated that her under-the-sink filter saved her time on trips, money on gas and bottled water, and pain and strain in her back, she was relating how the filter intervened in a meaningful way—or, put differently, intervened such that it freed up her funds of knowledge to work against other unfreedoms, to free up her human, monetary and social capital, so that she could mobilize her limited resources for other important exigencies in life. Likewise, when senores Jimenez and Ramirez stated that their rainwater-harvesting systems gave them more control over their water, while cutting back on time and money spent hauling, they were describing freed up capabilities, those being the freedoms that flow from having more time, money, and independence to manage their own water resources. In Cochran, Juan Garcia described being trapped by the water-hauling company, which had a monopoly and was hiking up prices. By securing water through the soft path and cutting back on supply, he made an argument that such tools and strategies as low-flush toilets and rainwater harvesting could give

him a modicum of control over his water, thus freeing him up from the tyranny of the hauler who charged ever more for water, while never bringing the agreed-upon amount. Here again, Juan Garcia related soft-path strategies to increasing his own agency and capabilities; resources saved in the domain of water could be repositioned for use elsewhere. At the same time, residents demonstrated funds of knowledge in understanding how to conserve and reuse water, how to build their own homes, how to plumb, repair appliances, replace toilets, and direct the flow of water—all of which walk hand-in-hand with soft path strategies. It is at this juncture, where the soft path intersects with funds of knowledge, that it shows potential for freeing up human capabilities.

Time and again, I witnessed instances where residents already possessed funds of knowledge in soft path strategies, building, plumbing, resiliency, and do-it-yourself problem-solving. As argued above, these funds of knowledge bolster the case for the soft path's potential efficacy in removing water burdens. Furthermore, as seen in the case of Ms. Shapiro, as well as others in Las Pampas and Cochran, the soft path fits in with extant funds of knowledge in such a way that it can free up human capabilities. This is a peculiar result that arises from the quotidian nature of water burdens, coupled with the funds of knowledge that have evolved in low-income communities lacking access to water resources. Insofar as the soft path removes substantial unfreedoms, those that arise from burdens of time, money, health, physical strain, and stress, it represents a development strategy that leverages capabilities. Added to that is the evidence—presented at length above—that many soft-path elements are viewed by residents themselves as fitting, worthwhile tools and practices that could ameliorate their water-insecure situations. It is where these three aspects converge—funds of knowledge, soft path strategies, and Sen's capabilities theory—that the soft path shows grounded potential. Ultimately, if the "State," or the

wider American society, continues to fail to meet its responsibility of providing adequate water for tens of thousands of *colonias* residents, then the substantial unfreedom of water-insecurity endures. In these cases, the soft path shows great potential to enter the space as a helpful alternative.

CHAPTER 4: DISCUSSION AND CONCLUSION

In this thesis I have presented results in three broad chapters. First, we examined conditions in two small, remote *colonias*—Cochran Mobile Park and Las Pampas—taking note of the day-to-day burdens residents experience there as a result of living in states of water insecurity. Next, I traced a multi-scalar discourse around water insecurity as it pertains to one of these *colonias*, Cochran Mobile Park, examining first the residents' needs and desires, then elucidating the wider discourse of exclusion within a neoliberal framework. In tracing this discourse, I attempted to show how residents contested the criteria by which they were excluded, while state, local, and regional decision-makers expressed being constrained by a lack of funding. This lack of funding I linked to a broader neoliberal political ecology that has seen to the precipitous withering away of public funding for environmental projects in the borderlands. For the third major section, I presented results on the soft path to water as a potential alternative for small, remote, and isolated colonias, demonstrating how residents possess funds of knowledge germane to the soft path's potential implementation, and, furthermore, how the soft path could synergistically leverage funds of knowledge to expand human capabilities. Though in many respects interrelated, each of these three sets of findings contributes to the body of science in its own distinct manner, with its own set of novel implications. Accordingly, I will discuss each set of findings separately, in the order that they were presented, before wrapping all results together in the conclusion with a methodological consideration and forward-looking considerations.

4.1: Discussion part 1: Water insecurity as a nexus

The notion of "water security" goes by many definitions and is applied to many different referents, each affixed to a given individual's or discipline's ontology. Jepson (2014) makes the

case that these definitions matter, especially for low-income communities lacking reliable access to water in the global north, because "water security" is so often "narrowly defined in terms of watershed environmental sustainability and homeland security." This being the case, a "pervasive myth" has been perpetuated in developed countries that all people have universal access to uniform indoor plumbing. Meanwhile, however, in the recesses of this narrow definition, an estimated 1.5 million Americans continue to live without indoor plumbing (ACS 2012). Consequently, as Jepson (2014) has it, "little is known about the complex experience of inadequate or unreliable water services for individual households in these marginalized communities."

Recent scholarship has attempted to draw these experiences out of obscurity in large part by focusing on water insecurity in the domain of human flourishing. In other words, rather than taking the nation-state or the ecosystem as the referent for water security, several scholars have made it their project to emphasize how low-income residents cope with and live through water insecure circumstances. As a leader in this effort, Jepson advances a definition of household water security in the domain of human development, "where water security is broadly understood as adequate, reliable, and affordable water for a healthy life" (Jepson 2014). She further puts forth a metric for measuring water insecurity, taking into account three important factors (Jepson 2014):

> (1) Water access: the capacity to access water for consumptive purposes, including physical access, affordability, and reliability.
>
> (2) Water quality acceptability: the broad range of biophysical characteristics of water quality (taste, color, smell, biochemical, etc.) that influences water usage and health/well-being.

(3) Water affect: the emotional, cultural, and subjective experiences of water.

Using these factors, Jepson indexes different degrees of water insecurity as experienced by *colonias* households, ie. determining whether a given household is (1) Water Secure; (2) Marginally Water Secure; (3) Marginally Water Insecure; or (4) Water Insecure. In doing so, she advances parameters for understanding household water insecurity, those being, access, quality, and affect. While access and quality are more straightforward, water affect has emerged as an important new domain, and even measuring stick, for conceiving the multifarious influences of water insecurity in peoples' lives. Sultana (2011), for instance, engages feminist political ecology and emotional geographies to consider the emotional freighting of struggles for water among actors in a case of drinking water contamination in a low-income Bangladeshi community. Her work "demonstrates that resource struggles and conflicts are not just material challenges but emotional ones, which are mediated through bodies, spaces and emotions." Likewise, Wutich and Ragsdale (2008) trace deep connections between water insecurity and emotional distress in Bolivian squatter communities lacking reliable water access. They present findings that water-related emotional distress was linked to gender as well as three water-insecurity domains: inadequate supply, insufficient access to distribution systems, and dependence on seasonal water-distribution systems. They argue that water-related emotional distress "develops as a byproduct of the social and economic negotiations people employ to gain access to water distribution systems…". Beyond the emotional suffering that arises from lacking water access, researchers have also connected it most saliently with health outcomes (Hargrove et al., 2018), economic outcomes (Hargrove and Del Rio, 2017, LVWD report), and environmental justice outcomes (Pulido, 2016). To summarize, then, at a household level, water

insecurity, as a lived condition, interfaces with aspects of access and quality, is emotionally and physically felt, and impacts upon important matters of health, household budgets, and time.

My research builds upon this complex and expanding understanding of household water insecurity by presenting an idea, and evidence for it, that water insecurity can be viewed as a nexus (figure X), wherein all these multifarious influences converge, and the lack of water, as defined by Jepson in the domain of human development, exacerbates and perpetuates an interlocking range of household insecurities—health, economical, emotional, and temporal. In this conception, water insecurity is situated both at the center of, but also in reciprocal relationships with, various, cyclical drivers of household insecurity—or what Sen might think of as unfreedoms. This conception emerged during interactions in the field, when residents clearly related their struggles with water insecurity as being both constitutive of and interwoven with a variety of quotidian burdens. In the field I found that low-income *colonias* residents lacking water access spend as much as 12 times more for water than nearby residents covered by utilities, that they use far less water, and yet that the bulk of the water they receive is of inferior quality. These hardships of quality and household economics blended, merged, and interacted with a multiplicity of additional quotidian, water-related burdens. Securing water impinged on time. Paying for water drew down bank accounts. Carrying heavy jugs, and lifting water into laundry machines, and bucketing and toting water throughout households and landscapes contributed to back pain (especially for elderly residents). Fretting over water quality and supply contributed to stress. So it was that these interrelationships swirled together in the minds of residents such that the clearest picture of the lived experience of water insecurity, at least insofar as it emerged in my interactions with *colonias* residents, is one that finds it hitched to and constitutive of an entire field of interrelated burdens and hardships, namely those which impinge

on common “goods” or “resources” that all people envision as conducive to happy, healthy lives: money, time, and health.

As Jepson (2014) made clear, our definitions of water insecurity matter, because, when they are too narrow, they delimit our concern. In developed nations, water-security definitions have served nationstates and ecosystems as their referents. My work here contributes to the project of bringing low-income residents out of the shadows and into the focus. If water insecurity can be viewed as constitutive of a series of burdens to low-income residents, many of which are well known in the scientific literature, then arguments contending that water security ought to be a priority are strengthened. Viewing water insecurity as a nexus sharpens this focus. Residents in Las Pampas and Cochran made this all too clear as they described to me the burdens with which they lived each day, hardships of time, stress, pain, and money, all of which related, in one way or another, to lacking water access.

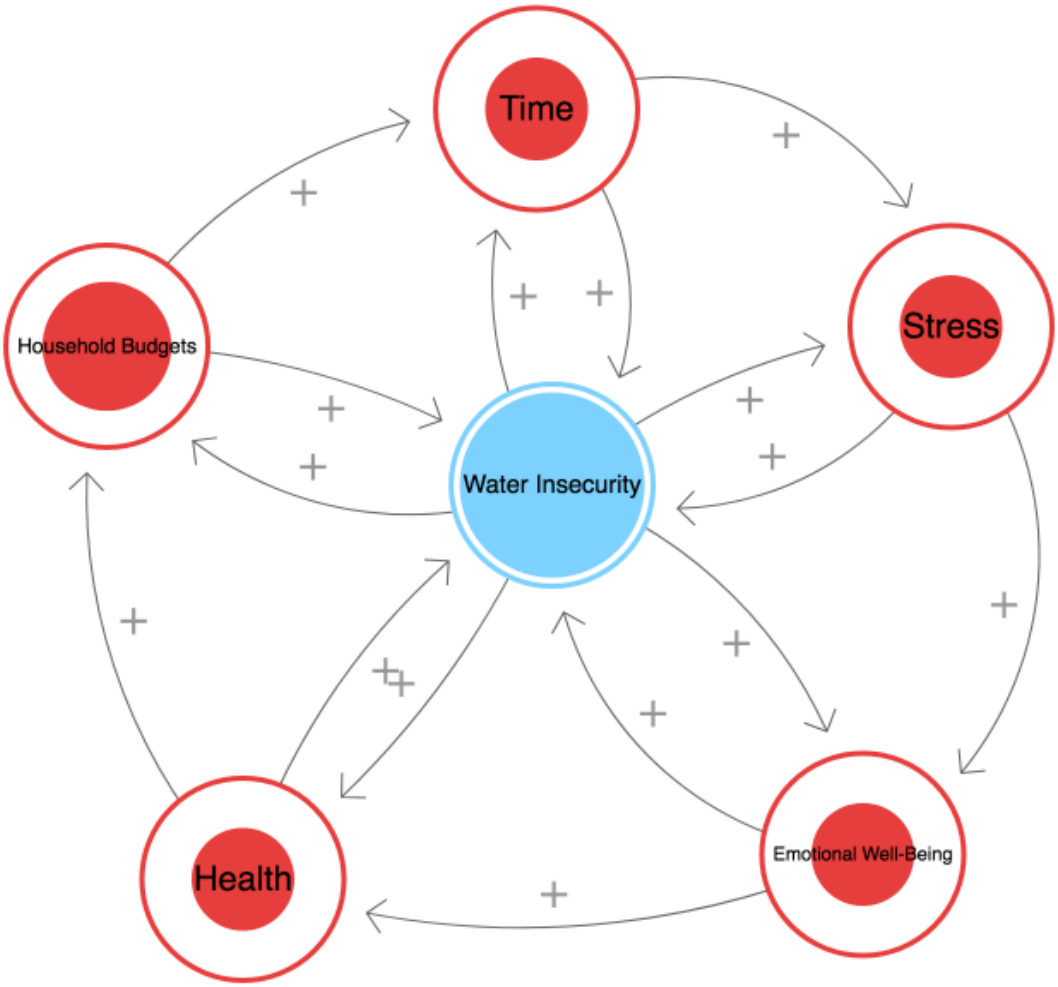

Figure 14: The water-insecurity nexus demonstrates how water insecurity is at the center of interlinking relationships between household budgets, time, stress, and emotional well-being.

4.2: Discussion part 2: New dimensions for neoliberal-discourse tracing and exclusion in low-income border populations

Low-income border populations are no strangers to the oppression of neoliberalism's invisible hand. Existing on the "periphery," far from the power centers of two nationstates, which are themselves characterized by an asymmetrical balance of power, the borderlands constitute a geography where capital, for the most part, is either created or passes through, but does not stay; where environmental problems condense and consolidate; and where low-income, racialized populations are all-too-often excluded from the benefits of wealth creation, but are

nevertheless disproportionately subjected to the health and environmental harms. In broad strokes, the "*colonia* phenomenon" can be viewed through this political ecological paradigm. People migrated to the border seeking opportunity. They were exploited by a number of industries that paid low wages. They were geographically marginalized as a consequence of these low wages and their inability to afford adequate housing in urban areas. Meanwhile, as a result of these industrial processes, and as a part of the procedures of accumulating wealth, the border environments in which they lived were polluted and contaminated. Simultaneously, they continue to be excluded from the common environmental benefits most other residents enjoy—water insecurity being a case in point. In this way, low-income border populations, such as those living in *colonias*, fit the description of what Pulido (2016) has termed "disposable people." Pulido's lucid description of Flint, Michigan's water crisis could thus be readily applied to borderland *colonias* excluded from water access: "The decision to neglect infrastructure so that it becomes toxic must be seen as a form of violence against those who are considered disposable. This is the politics of abandonment."

In light of this "politics of abandonment," and the environmental injustices such a politics upholds, it becomes important to understand how low-income, mostly Mexican-origin populations are rendered "disposable." How is it that certain groups of people find themselves disproportionate recipients of environmental hazards? Relatedly, how do certain raced, sexed, and gendered communities find themselves excluded from environmental goods, such as clean air, healthy food, and access to quality, reliable water? Answers to these questions matter because the first step to effectuating a solution is to deeply know the problem, that is, the system of ideas, institutions, and relationships that give the problem shape. To that end, I have applied the method of discourse tracing to a case study of Cochran Mobile Park to understand a) how

colonias residents contest their exclusion, b) how decision-makers rationalize exclusion, and c) how these exclusionary narratives, and their contestations, are embedded in a broader neoliberal discourse. Applying this method revealed new insights into how discourse, embedded in a neoliberal political economy, works to exclude *colonias* residents in the hydrosocial waterscape—a politics of abandonment that occurs in spite of residents' contestations and efforts to mobilize.

In recent decades, researchers in the fields of anthropology (Hill 2001, Heyman 2012), political science (Staudt 2017, Mumme 2007), and geography (Vandewalle and Jepson 2015), among others, have deconstructed the complex relationships between neoliberalism and border populations. Staudt (2017), for instance, unpacks the role of "overarching neoliberal regimes," among other influences, as a key factor for why a coalition of grassroots organizations in the Westway *colonia* were ultimately blocked from holding the nearby Border Steel plant accountable for cancer clusters within their community. Despite years of organizing and well-known evidence from epidemiological studies, the residents were unable to muster the social and political capital necessary to hold the polluting industrial plant to account, leading Staudt to declare: "The ideologies that support limited government, market-generated change, and individual responsibility have triumphed, at least in the state of Texas" (p. 317).

Looking specifically at water-insecure *colonias*, Jepson et al. (2017) have advanced a "relational approach" to water in the hydrosocial waterscape. As described previously in this thesis, the relational approach calls attention to water-access as a process and envisions the hydrosocial waterscape as a broad physical, social, and geographical system, to include not only physical infrastructure (water pipes, spigots, treatment plants), but also geographies (landscapes, mountains, deserts, river systems), institutions (water utilities, water-funding agencies, the

political system, the legal system), and social relationships, such as those shared among individuals, communities, and institutions. Such a conception, of course, vastly expands the frontiers upon which one might embark to understand the drivers and causes of water insecurity. And Jepson, along with Vandewalle, Wutich, Brewis, Brown, and others cited variously in this work, have applied this relational approach to household water insecurity to interesting effect.

"The application of critical scholarship to household water deficiencies emphasizes the political processes that limit access to potable water," write Jepson et al. (2017). Discussed in the literature review of this thesis were two such examples of how examinations of the relationships embedded in the hydrosocial cycle reveal not only the mechanisms by which *colonias* become excluded, but also how neoliberalism rears its head as the paradigmatic factor. To briefly review: First, Jepson and Brown (2014) examined south-Texas water vending machines to show how *colonias* residents come to accept their positionality as disciplined water consumers, which amounts to their being "enrolled as neoliberal subjects." Similarly, Vandewalle and Jepson critically appraise a "state-market-university alliance" that shifts responsibility from the government to the consumers themselves to ensure their drinking water is potable. This occurs, according to the authors, through the deployment of point-of-use filters into *colonias* households. In doing so, the state-market-university alliance does not ameliorate the problems of water insecurity, but rather opens up a new market for filter manufacturers, all while "individualizing" the responsibility for potable water to the low-income, end-users themselves.

My examination of the hydrosocial waterscape adds new findings and new critical dimensions to the relational approach, especially as it pertains to *colonias* embedded (and embattled) in a neoliberal political ecology. I compared and contrasted the discourse around water projects themselves, putting the comments, wishes, desires, and aspirations of *colonias*

residents in conversation with the rationalizations offered by decision-makers for why a project was "infeasible" in Cochran Mobile Park. In doing so, I probed for disjunctures and disconnects between *colonias* residents and decision-makers, and I found several that were salient. One can think of these results as a sort of blueprint of discursive exclusion. First, I traced how and why residents wanted access to water, comments that outlined hardships and aspirations discussed in the previous section. Since the long-running, multi-generational efforts to influence local, state, and regional actors to bring a project to Cochran had continuously and repeatedly petered out, residents expressed sentiments of abandonment, an admixture of hope and resignation, and dissatisfaction with local representatives and utilities. Disjunctures in the discourse further illuminated how the communication broke down around expectations, means, and ends. For instance, *colonias* residents contested the engineering costs of the proposed infrastructure project, arguing (correctly) that the estimate was high. However, various decision-makers—over the course of many years—expressed to residents, and later to me, an inability to bring those engineering costs down. Additionally, Cochran residents desired water primarily for its utility, but also because water access conferred an achievement in terms of social and material success. To meet these ends, they often advanced arguments for informal means of getting a project off the ground, yet these informal arrangements shattered against a rigid institutional framework, with a seemingly insurmountable series of criteria, rankings, environmental impact statements, and arbitrary jurisdictions, also called "donut holes." Thus, it can be said, according to the discourse, that Cochran was largely excluded from conventional water access because of its small population, remote location, high cost per connection, existence in a jurisdictional no-man's land (donut hole), and an overall lack of funding for water projects.

It merits remembering that Cochran is not an isolated incident, but is rather reflective of similar situations that repeat all up and down the 2,000 mile border. By laying these reasons-for-exclusion bare, a clear view of the environmental injustice comes into focus. Those factors just mentioned, according to the discourse, contribute directly to the rendering of *colonias* residents as "disposable people." Moving forward, then, researchers, decision-makers, politicians, and advocates who take seriously the notion that water access constitutes a basic human right can begin drafting policy that tears these specific barriers to access down. Such actions might differ slightly in other community contexts. In Cochran, this would mean redrawing districts so that the community is brought into the aegis of a nearby utility; reconceptualizing a water-infrastructure project that does not require destroying and repaving roads, thereby cutting back on costs; and, finally, reimagining the hydrosocial waterscape such that it places primacy on water security for the society's least-well-off members.

Which brings us to the final finding revealed in the discourse: what I tend to think of as the oppression of neoliberalism's invisible hand. To the degree that the borderlands geography has been transformed into a magnet for rapid industrialization, commerce, and booming populations, funding and programming for environmental infrastructure projects have never kept pace (see Mumme and Collins 2014). Even in the post-NAFTA funding heyday of the late 1990s, estimated environmental needs vastly outstripped public-funding allocations. As of this writing, the disproportionality between industrializations' host of negative externalities and the insufficient capital devoted to cleaning up after them has likely reached an apogee. By 2018, for example, the Economically Distressed Areas Program had entirely tapped out its bonding potential. Likewise, the Border Water Infrastructure Program's funding had been whittled away; whereas in the late 1990s, the program commonly saw funding in excess of $100 million—in

some years reaching as high as $150 million—2001 signaled a post-9/11 era of federal retreat from border-environmental programming. This retreat is captured in the presidential budget requests table, which shows a steady sink in funding requests, culminating in the 2018 attempt by the current administration to zero-out the BWIP program altogether. Ultimately, BWIP received $15 million in 2018, owing to efforts from senators in border states; nevertheless, the estimated costs of environmental needs greatly exceed funding, a fact plainly expressed by an EPA engineer: "(We have) estimated costs of $250 million for projects in the pipeline this year. That's 25 years of current funding appropriations."

What we are witnessing in these relationships are the hallmarks of neoliberalism. Industries on the border are given wide latitude to pollute, to pay low wages, to protect their assets and capital from taxation, and to generate great wealth (U.S. trade with Mexico, much of which flowed through the borderlands, neared $612 billion in 2018 (U.S. Census 2019)). Meanwhile, government funding on environmental programs that could remediate damage done by commerce, trade, and industrialization to the borderlands and border populations has attenuated. My tracing of the discourse brings into relief, in a novel way, the oppression of neoliberalism's invisible hand by showing directly how these hallmark neoliberal outcomes break down on a particular low-income community that lacks access to water. This oppressive hand reveals itself most clearly in five ways. First, residents themselves have mobilized to seek access to water, couching the argument in terms of basic human need. Second, in answer to these entreaties, several local decision-makers cited a shortfall in funding as a primary reason for why such a project cannot be delivered. Third, state representatives during a public meeting directly stated that funding for environmental projects was negotiated down by representatives espousing a small-government ideology. Fourth, comments made by NADB officials and EPA engineers

revealed a merger between the two major border-environmental-infrastructure institutions, and a shift to private-sector loans as opposed to grants for public-water projects. And fifth, a review of state and federal budget allocations to water-infrastructure projects shows a clear and precipitous decline. So it is that the impacts of neoliberalism are felt most acutely among the urban and semi-urban poor, such as those living in communities like Cochran.

In light of the realities emerging from this discourse, what are we to do? I argue in the methodological discussion below that there is no silver-bullet solution—that the exigencies of water insecurity should be met in a full-court-press, so to speak, and at a variety of different scales. Jepson et al. (2017) make a strong, broadly-encompassed case that the heart of the issue resides in our definition of water insecurity. "It is time to reorient the concept of water security away from a utilitarian focus on material water and towards a critical approach based on water-society relations" (Jepson, 2017). Here again we have circled back to an examination of the causes, consequences, and drivers of water insecurity as all being rooted in "water-society relations." This approach eschews viewing water security as a problem to be solved by obtaining "H20" as a commodity, but rather orients our concentration toward the broad set of social relationships in the hydrosocial cycle. Write Jepson et al. (2017):

> This allows us to pose questions that are fundamentally different to the existing dominant concern about how to improve and/or expand water provision. We thus ask: What are the social, cultural, and political relationships with water resources and flows that advance a life that fosters human dignity? And, how are those relationships secured to facilitate the freedom to achieve wellbeing, fulfilling social arrangements, and human flourishing?

In tracing the discourse, I have done just that, outlining the needs, desires, and aspirations of *colonias* residents as they related to water, the relationships that led to their exclusion, and the

oppressive hand at work as a mechanism inherent in the neoliberal regime. This review points to a need for policies of inclusiveness, ones which do away with donut holes, and, to the extent necessary, ones which remove or rework strict ranking criteria and ancillary engineering costs that serve to keep people in states of water insecurity. It also reaffirms the need for a regime change; in a borderlands where much wealth is created, more should stay, and one way to do that would be to devote the needed funding to social and environmental projects that help the least-well-off members of the society who were integral in creating that wealth in the first place. Even so, while these policy changes and paradigmatic overhauls would no doubt be the preferred remedy—and while as a researcher and advocate I personally remain committed to producing knowledge aimed at structural change—cultural, governmental, and even policy revolutions unfold at a pace that is incommensurate with the ongoing needs of residents in *colonias* who lack reliable access to water. For instance, some Cochran and Las Pampas residents have been without water for more than 25 years. With this observation in mind, we can now turn to a discussion on findings respecting the soft-path to water as a potential alternative for communities in situations similar to Cochran and Las Pampas.

4.3: Discussion part 3: Toward a soft path to water

We know that the majority of people in Texas *colonias* lacking water access increasingly live in locations that are small, remote, and isolated. These conditions, as established by Hargrove et al. (2018), as well as the reports by Las Colonias (2015) and RCAP (2015), and further corroborated in my discussions with decision-makers, make it exceedingly difficult to ensure all borderlands residents are connected to conventional water and sewer infrastructure. Not only are funds for environmental programs along the border in decline, but the high costs-per-connection for the many scattered, sparsely populated communities dissuade granting

agencies from approving conventional water projects, which, in their estimations, benefit few people at the expense of large capital outlays. Yet, the U.S. is committed, as per the United Nations Sustainable Development Goals, "to ensure all, not just most, people have access to water" (Hargrove et al., 2018).

In view of these facts, I gathered first-of-its kind data on perceptions of *colonias* residents regarding the soft path to water. These data establish a baseline for insight into the soft path's potential efficacy as an alternative to simply allowing conditions of water insecurity to persist. The proposition put forth by Hargrove et al. (2018) is that the soft path could be "the water policy that can address the water injustice remaining in the U.S./Mexico border region" (Hargrove et al., 2018). This proposition is made on the grounds that the soft path is a) less expensive than conventional hard-engineered infrastructure, and b) more readily deployed in "small, remote, and isolated situations," such as those characterizing many of the remaining *colonias* without conventional water access. (In other contexts, the soft path has been advocated on the basis of its representing a more sustainable set of principles for managing water at various scales (see Gleick, Brooks, Cain)). It would be a mistake to assume these three terms—"small, remote, and isolated"—must come together in order to fully explain why a particular community lacks access to water. Rather, these criteria can be thought of together or individually as starting-point characteristics for communities where these very specific applications might apply. That is to say, "small, remote, and isolated" might, in some cases, be disarticulated, and yet still the place in question could fit the bill, as it were, of a relevant candidate for soft-path strategies. This was the case, for example, in Cochran, which was not so remote as it initially seemed. Nevertheless, owing to its small size and political isolation, among other factors, Cochran households present themselves as candidates that could potentially benefit from soft-path

strategies. That being said, soft-path strategies show potential for *colonias* that are small and/or remote and/or isolation, and/or any combination thereof, in their application of four key principles:

1) decreasing demand for water through conservation measures and reduced-use technologies,

2) increasing water supplies through improved use of local sources, such as rainwater harvesting,

3) improving quality of water through point of use treatment technologies, and

4) increasing water supplies through decentralized waste treatment and reuse.

However, the soft path faces barriers in terms of 1) lack of knowledge of soft-path technologies that are feasible, 2) lack of capacity to install and maintain technologies, and 3) lack of financial resources to purchase equipment and supplies. My baseline data and interpretations illuminate findings primarily as they intersect with barriers one and two. Additionally, my results shed light on whether residents themselves perceive that various soft path techniques and technologies would be potentially helpful and/or worthwhile interventions. As detailed in the results section above, on the whole, residents in Cochran and Las Pampas did express interest in soft-path strategies, with more popular interests in point-of-use filters, rainwater harvesting, low-volume sink aerators, low-volume showerheads, and micro-sewage treatment plants. Beyond this straightforward interpretation of survey results, I also witnessed a diffusion of innovation which took place in the field, a phenomenon whereby ideas, technologies, and/or behaviors took hold and began to spread throughout the communities. In both Las Pampas and Cochran, residents observed rainwater harvesting and under-the-sink filters, respectively, and, as a consequence of observing those technologies, wanted them in their own homes. Moreover, many residents

displayed complex funds of knowledge directly related to soft path strategies and principles, deploying such practices as stormwater capture, laundry-to-landscape greywater reuse, using low-flush or dual-flush toilets, and generally attempting to conserve or otherwise stretch water resources. These direct bodies of knowledge related to soft path strategies were further complemented by funds of knowledge that could, by inference, be helpful in the event of future soft path implementation, including knowledge and skills around plumbing, gardening, pump maintenance, home repair and building, and a general self-help mentality. Finally, it was in this confluence of assorted skills and techniques—funds of knowledge and soft path strategies—that I perceived a synergistic leveraging whereby the soft path could add to and build from existing funds of knowledge to free up human capabilities. For example, residents in both communities described how the soft path did already or could potentially alleviate quotidian water-related burdens that held them back from other capabilities; these burdens, as it happens, constrain those resources which all of humanity holds in high value: time, money, energy, and health. This, then, offers a new way to conceptualize funds of knowledge as they relate to water insecurity and Amartya Sen's capabilities approach.

The upshot of this synergistic leveraging is that a stronger case can now be made for the potential efficacy of soft-path strategies in so-called "no-win waterscapes" (Jepson 2014). These baseline results suggest that a) many residents were interested, b) many residents have already, to varying degrees, embarked upon the soft path, c) certain soft-path strategies already show early promise for diffusing, and d) residents have conceived of the soft path as a strategy by which they can leverage existing funds of knowledge and capabilities. Strong as these results are, however, they are tempered by the fact that, in Cochran especially, residents made it abundantly clear that they would much prefer conventional water infrastructure. Interestingly, this sentiment

did not present as strongly in conversations with Las Pampas residents (though many Las Pampas residents did state they desire conventional infrastructure as well), a circumstance likely emanating from the fact that Cochran sits so close to an existing water line. In any case, these soft path results open new frontiers for applied academic research on water insecurity, both in *colonias* and other low-income, remote, rural areas where conventional water-infrastructure projects remain just beyond arm's reach. To that end, I submit three areas where more research is needed:

First, more work is needed to understand residents' perceptions and funds of knowledge around the soft path. This baseline (N=22) demonstrated the initial potential for certain technologies, especially under-the-sink filters, rainwater harvesting, sink aerators, low-volume showerheads, and packaged sewage treatment-and-reuse plants. These results are limited to perceptions in two case studies in two small *colonias* A larger sample, spread among more locations, would be illuminating.

Second, additional research is needed on the long-term usage patterns of soft-path technologies, including residents' willingness and capacity to maintain the technologies. For example, my results on under-the-sink filters were mixed, indicating some residents were very happy with the filters, whereas others expressed confusion, and one so disliked it that he dismantled it. Additionally, the two residents who had rainwater harvesting systems expressed that the systems were very helpful, but mentioned lack of rainfall as a limitation. Longitudinal studies could contribute much-needed knowledge as to the sustainability of various soft path technologies, taking into account questions of maintenance, longevity, and consistency of use.

Third, the soft path to water, as envisioned here, is not a means by which to shift the expense and burdens of securing reliable access to clean water to low-income residents

themselves. On the contrary, the preponderance of evidence presented speaks to its potential for alleviating water-related burdens as they sit at the nexus of time, stress, health, and budgets. That said, for the soft path to work, and to *work against* the injustice of water insecurity, it would require institutional backing and capacity, both technical and financial. Whether this backing comes from universities, NGOs, water utilities, county, state, or federal agencies, or some combination thereof, the responsibility should fall to societal institutions, not residents alone, to fund, maintain, and build-out capacity for these techniques and technologies. But this vision opens a realm of complexity. What institutions would be best suited for long-term operations and management? How could institutions build such a capacity into their current programming? Where might funding for such programming come from, and how might institutions flexibly adapt to decentralized water and sanitary systems? Since the soft path remains largely untested, very little information exists to answer these questions. For that reason, the research presented here could offer grounds for pilot projects by which soft path strategies could be tested and measured in both the short and long term.

4.4: Concluding Remarks

Understanding water insecurity as a nexus influencing other quotidian burdens; revealing the oppressive hand of neoliberalism at work in discourses of exclusion; and illuminating the synergistic leveraging of soft path, funds of knowledge, and human capabilities—these represent three major insights that emerged from a mode of approaching and of being in the field, which I described as ethnographic fieldwork on multiple fronts. Water insecurity itself is prismatic; felt at physical and emotional registers, derived from abstract, overarching structures, a consequence of something as physical as geography and as socially constructed as race, the concept is at once fluid and concrete, abstractly realized but discerned in the down-to-earth, daily struggles of

residents like Ms. Shapiro, Mario, and Señora Hernández. A reconceptualizing of water insecurity as a processual outcome, arising out of social relations, is helpful for putting a finger on its consequences and originations. No doubt, the perpetuation of water insecurity in the Global North links to our definitions of what water security means, the commodification of the resource most basic to human survival, and the overarching socio-economic and political structures that refer to water, and to people, as disposable, as commodities, as something that can or cannot be afforded. In exposing such structures, researchers and advocates contribute to the important work of knowing their shifting forms and configurations, a precursor to reshaping them—or, more radically, tearing them down.

But we can also do more. In the field, when speaking with residents in *colonias*, discussions of power and markets and governance were certainly informative—but only to a point. Residents wanted to know what was next. What could be done? And if I were to tell them that they were hapless victims embedded in societal definitions of water and systems of control that were, well, beyond their control, I suspect that I would not have been invited back. Not only because this would have been untrue. Residents were anything but hapless victims. As I hope is clear from the many ethnographic portraits in this work, the people I met demonstrated enormous resourcefulness, tenacity, and grit, especially in their continued mobilizations within a hydrosocial waterscape that had met their contestations, time and again, with indifference. But also because, for all its explanatory power, linking the plights of the poor back to neoliberalism, as I have done here and so many progressive scholars have done before me, ultimately falls short of orienting the researcher's presence toward some sort of positive solution.

"What now?" This is the question that most interested residents. Perhaps it is what Heyman means when he writes of the "inverse of power" and "counterpart ideals." "There is

need," writes Heyman, "for more acknowledgement of constructive ideas and experiences, because they also form part of the human experience, they are what our ethnographic collaborators value and often talk about, and they indict the destructive effects of unequal power as effectively as criticism, if not more so." Heyman is not the only anthropologist to have detected the "unrelentingly negative and critical" tenor of recent scholarship. Ferguson (2009) minces few words when he opens his essay with:

> In thinking about the rapidly expanding literature on neoliberalism, I am struck by how much of the critical scholarship on topic arrives in the end at the very same conclusion—a conclusion that might be expressed in its simplest form as: "neoliberalism is bad for poor and working people, therefore we must oppose it." It is not that I disagree with this conclusion. On the contrary. But I sometimes wonder why I should bother to read one after another extended scholarly analysis only to reach, again and again, such an unsurprising conclusion.

Ferguson goes on to explain the ways in which this tendency engenders a politics "largely defined by negation and disdain," one focused on what he calls "the antis." "Anti-globalization, anti-neoliberalism, anti-privatization, anti-imperialism, anti-Bush, perhaps even anti-capitalism—but always 'anti', not 'pro.'" And he advances, in place of yet another piece of criticism ascribing the plight of the poor and the working to neoliberalism, an idea that certain "arts of government" or "governmentalities" might draw from the "neoliberal bag of tricks" to do things that are—in contrast to conventional thinking on the subject—good for the poor.

For his part, Heyman engages the notion of "counterpart ideals" as power's inverse. He makes the point that when one writes about power's negative aspects, the writer simultaneously implies an inverse—or, in his phrase, "counterpart ideals." Even as critical scholars often imply

such counterpart ideals, we have by and large eschewed airing them in open scholarship. "By hiding such ideals either in the pretense of arm's-length scholarship or in assumed, unspoken agreement with politically critical positions," writes Heyman, "we do a disservice to such ideals, for we do not subject them to open debate." In an earlier work, Heyman (1998) engages the use of "constructive writing" to exemplify what he means by presenting counterpart ideals. Rather than stop at indicting an immigration system that erodes toleration, deepens division, and pushes many migrants to come covertly into the United States, Heyman constructively imagines a different immigration policy, one organized under regional compacts that would "encourage moral reciprocity." For our purposes here, the key is to note that both Heyman and Ferguson, while still critical of oppressive structures, sought to describe alternative, positive structures that could be erected in their place.

I have attempted to do something similar in this thesis. In solidarity with the residents of Cochran and Las Pampas, I sought to understand the lived experience of water insecurity, to take note of its originations and drivers, and to seek solutions along a variety of paths. These paths presented themselves at different scales and as a result of different modes of ethnographic inquiry. In the communities, residents demonstrated how water arrives and moves throughout their landscapes and households. They described water burdens as being at the center of numerous other hardships, impinging on time, budgets, health, and stress. In Cochran especially, residents expressed a strong desire to be connected to a nearby water source. Through a method of applied-participatory research, I sought to ally myself to this cause. I attempted to further their project along, presenting reports, drafting letters, relaying information, and writing fact sheets, all of which were aimed at moving local decision-makers to act. At the same time, holding the exigencies of water insecurity in mind, this project turned to an interrogation of the 'discourse of

exclusion,' which illuminated not only the workings of neoliberalism, but also a different set of paths for substantive policy changes that could alleviate water insecurity among *colonias* residents. This set of policy paths included redrawing districts to encompass 'donut holes,' re-thinking strict, exclusionary ranking criteria, and reworking water-infrastructure projects in ways that meet the needs of water-insecure communities, as opposed to rigid institutional codes of compliance that often drive project costs up. And still, other pragmatic realities required attention—those being geographical remoteness, sparse and scattered populations, and declining funding for environmental projects. These realities suggested an alternative in the soft path to water as a potential supplement to ameliorate water insecurity, specifically in remote locales where conventional water access seems highly unlikely. Along this path, residents demonstrated their resilience and resourcefulness by way of complex funds of knowledge that have evolved around water conservation, plumbing, home building, and a general self-help way of living. These different pathways could all represent "development as freedom" in that they each show promise and potential for freeing up human capabilities. And not one pathway is mutually exclusive to the other. My simple methodological point, then, is that researchers in the field need not ally themselves with one approach—say, the critical approach—to the exclusion of others, because in many complex problems embedded in coupled human-environmental systems, there are likely many paths to improvement.

Residents in Cochran and Las Pampas stand at the intersection of these paths. Looking forward, new research could strive to both broaden and deepen the discussion on neoliberalism's hand in reproducing conditions of water-insecurity among low-income border residents; new policies could write-out the barriers that make arbitrarily expensive engineering projects and jurisdictional zones of exclusion; and new studies could build toward the soft path to water,

demonstrating how it could be sustained over the long term, and how it might further leverage funds of knowledge to bolster human capabilities. It is along these paths—at times converging, at times diverging—that *colonias* residents, and their advocates, might work together to see their way out of water insecurity.

EPILOGUE

As this thesis drew to a close, three positive developments came to light that could bode well for Cochran Mobile Park residents as well as many Texans living in conditions of water insecurity. First, Texas voters in November approved a ballot measure that would grant the Texas Water Development Board authority to seek $200 million in bonds. These funds would go to revitalizing the cash-strapped Economically Distressed Areas Program, which has been instrumental in bringing piped water and sewer infrastructure into the homes of thousands of Texans. As positive as this vote is, it is worth noting that the $200 million in funds represent less than half of the $420 million in estimated needs. Moreover, whether these funds would go to a project in Cochran remains to be seen. In considering the bill that led to the ballot initiative, Texas legislators circulated a list of dozens of *colonias* that lack water and sewer services. Cochran was not on that list, and, despite efforts to get the community on the list, Cochran remains excluded as of this writing because it does not meet one of five criteria. Cochran lacks a community sponsor.

However, several factors seemed to be aligning in November of 2019 that might change the state of affairs in Cochran. During a late-October meeting, the Lower Valley Water District manager presented plans to connect the community to water. These plans were contingent on an interlocal agreement between the LVWD and Horizon MUD, under which the Horizon MUD would have to agree to allow the LVWD to build a water pipeline through their jurisdiction. Additionally, the plans were contingent on securing funding from an out-of-state NGO. In a testament to Cochran residents' understanding that the original engineering cost estimates of $1.6 million were exorbitantly high, the tentative plan presented by LVWD had total project costs at $500,000—that is, $1.1 million less than the original project cost estimates provided by

the county. LVWD representatives said they were able to reduce costs by doing design and engineering work in-house and by running pipes alongside the roads, thereby avoiding costs associated with tearing roads up and repaving them—which, as a reminder, is exactly what Cochran residents had recommended. Whether the project fruitions, of course, is a matter that only the future can tell. In 2016, residents were led to believe a project was in the works, but that project never came to pass. Nevertheless, representatives from the LVWD confidently stated that they would undertake the project. "We're going to take them under our wing," said the utility's manager, who also evinced a concern for local residents lacking water access that went beyond his utility's ability to pay. "We firmly believe there shouldn't be anyone in the valley without water," the manager said.

And last, the Center for Environmental Resource Management received a grant to install up to three rainwater harvesting systems on homes where residents lacked adequate access to water. These homes, in addition to the homes described in Las Pampas, are likely to represent the early beginnings of a pilot project to test soft-path strategies in remote *colonias* without access to water. Building from this work, further research can now be carried out over longer periods of time to test whether soft path systems fit meaningfully into the lives of *colonias* residents living in conditions of water insecurity.

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APPENDIX

Cochran Water Insecurity Report (English version):

Securing water for an unserved El Paso County community: A report on water needs, economic hardships, and potential solutions for Cochran Mobile Park

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Cochran Mobile Park is a community of 23 homes in the eastern portion of El Paso County. The subdivision was formed in the 1980s after William B. and Margaret S. Cochran bought county land and parceled it out into lots for sale. Despite having existed since the early 1980s, the Cochran community still lacks basic water and sewer service.

Research for this report was conducted in February-May 2019 to determine why the low-income community still lacks access to water, how the community manages under such water-precarious circumstances, and what could potentially be done to provide water access. During interviews, it was ascertained that a water-service line already exists in the nearby community of Agua Dulce. Administered by the Horizon Regional Municipal Utility District, this water line terminates within three-tenths of a mile of the unserved Cochran community. Many of the Cochran residents interviewed for this report expressed a strong desire to have the water line extended this short distance so that their families could enjoy reliable access to potable water.

In light of these circumstances, this report calls to attention three main findings:

1) Despite using less water than average El Pasoans, low-income residents at Cochran pay far more for water of inferior quality, all of which goes to meeting their most basic water requirements;

2) Cochran residents reported numerous hardships that go above and beyond the economic burdens related to obtaining water for basic needs; and

3) by failing to deliver reliable water to Cochran residents, governmental and societal institutions keep low-income residents in water-precarious situations, further entrenching and reproducing cycles of poverty and inequality.

Establishing these findings, the report concludes with barriers to delivering Cochran water and potential solutions that will ensure all El Paso County residents have access to clean, reliable water.

Finding No. 1: Household Water Economics--Cochran compared to El Paso

A 2016 income survey conducted by the County of El Paso revealed that all Cochran households earned incomes classified as “low” or “very low.” This portion of the analysis demonstrates how low-income residents of Cochran pay far more for their monthly water supply than average El Paso households—even though Cochran residents receive non-potable water and use far less water than average El Pasoans.

The majority of households interviewed—9 of 11—reported obtaining their water by purchasing it from a water-trucking company, which hauls water to their homes and deposits it in

tanks in their yards. The remaining three households collected water by driving to friends' and/or family members' houses in nearby neighborhoods, filling tanks with garden hoses, and hauling water back to their homes—an informal practice known as "water sharing." Every household interviewed reported that they did not drink hauled water, but rather used it for other water-related purposes, such as washing dishes and clothes, showering, flushing toilets, and watering plants and domestic animals. Residents reported not drinking the hauled water for fear that it had been contaminated either in the process of hauling or storage in difficult-to-clean tanks outside their homes. On the one hand, this meant Cochran residents did not report any illnesses related to water consumption. On the other, Cochran residents paid an additional price for water of potable quality, which came in the form of bottled water and/or five-gallon water jugs.

Of the 9 households interviewed that paid a water-trucking company for hauled water, 7 were families of 3 or more people. These families reported receiving one or more loads of water per month, whereas the two remaining households, which consisted of one and two household members respectively, received water far less frequently—in both cases, one load every three months. Table 1 shows the estimated monthly cost of water for the 7 Cochran families who purchase hauled water on a regular, monthly basis. For these 7 families, the average monthly cost—which includes hauled, non-potable water and bottled water for drinking—is $156.28.

Table 1: Monthly water costs for Cochran families hauling water on regular basis

Family	Household Size	Hauls/Month	Cost/Haul	Potable Water Costs	Total Water Costs/Month
Family 1	3	2	$60	$30	$150
Family 2	5	2	$75	$32	$182
Family 3	N/A	1	$70	$30	$100
Family 4	8	2.5	$75	$40	$227.50
Family 5	N/A	2	$75	N/A	$150
Family 6	6	1	$65	$30	$95
Family 7	4	2	$75	$30	$180

At $156 per month, the average Cochran family pays much more for water than the average El Paso household, which pays $57.95 (El Paso Times 2019). One Cochran family reported a monthly water bill of $227 per month, nearly four times the average El Paso water bill. Whereas customers served by the El Paso Water Utility receive water of potable quality,

low-income Cochran residents pay more for water of inferior quality. Moreover, Cochran residents use far less water than average El Paso households. For example, a Cochran household receiving two loads of trucked water per month consumes about 5,000 gallons, plus an additional 50-100 gallons of potable water per month. According to the Texas Water Development Board, per-capita residential use in El Paso is 86 gallons per person per day (gppd). Based on that figure, an average household of four in El Paso uses 10,664 gallons per month. Thus, the extent of the economic injustice related to water bills in Cochran can be summed up as follows: **Compared to an average household of four in the El Paso Water Utility service area, Cochran families, on average, pay 2.6 times more for water of inferior quality, and, for that amount, receive less than half the supply.**

Finding No. 2: Hardships in meeting basic water needs

During interviews, residents discussed numerous hardships related to meeting their basic water needs that go above and beyond the economic injustices detailed above. Ten of the 11 residents interviewed expressed some degree of frustration with the fact that they lived in a community--many for as long as 20 or 30 years--without access to water services. The hardships expressed during interviews included:

- Concern that children were growing up without access to piped-water infrastructure;
- Concern that the price of trucked water keeps rising;
- Large amounts of time spent gathering water;
- Stress arising from fear that water tanks would run dry;
- Physical hardships related to elderly residents hauling, ladling, and transporting water;
- Difficulties in maintaining pumps and keeping outdoor tanks clean;
- Frustration that lack of water service had left the area in a state of semi-abandonment, so much so that residents from surrounding areas frequently dump trash and dead animals there;
- Disappointment that landscaping, such as trees and gardens, could not survive in the area for lack of water;
- And lack of trust in the water-hauling company, which residents say frequently fills their tanks with less than the 2,500-gallons for which they pay.

Two of the 11 households interviewed relied solely on hauling their own water. Residents engaged in this informal practice of "water sharing" drove on a weekly and/or daily basis to friends' and/or family-members' houses in nearby communities to fill up tanks of water and haul them back to their homes. These trips exact a heavy toll in terms of time, physical hardship, and mental stress. One grandmother, for example, explained that her back constantly hurt from handling heavy pumps, hauling tanks and hoses back and forth, and ladling water into her washing machine. (To save water, she directs the washing-machine discharge into a drum. She then scoops this water back into the washing machine for a subsequent wash, thus washing two loads of clothes with the same supply of water, before discharging it to her trees outside.) For drinking water, she reported spending $100 a month on five-gallon jugs and bottled waters. Each weekend, when not at school or work, members from her household--which consisted of 12 individuals--would make between 4 and 8 trips to a nearby neighborhood to fill their tank with

water. As she explained it, these trips consumed almost the entire weekend. “The tank takes 45 minutes to fill with the hose,” she explained. “But if we don’t do it, how would we have our water?”

Finding No. 3: Keeping families in precarious water situations

Residents often explained that their connection to water was subject to breakages and discontinuations. Without consistent, reliable access to water, Cochran families live in a state of water insecurity, sometimes having to go multiple days without water for showering, cleaning dishes, and washing clothes. For example, multiple residents explained that the cost of hauled water began to drastically rise when one of the two water-trucking companies on which they relied went out of business. “It used to be $30, then it went to $40, $50, $60. Now, we pay $75 for (each load of) water,” one resident explained. “When the other company closed, that’s when the price went up,” said another resident. “They started charging us more. It’s a monopoly.” One mother expressed concern that almost the entire community relied on water from one trucking company. Recalling that the other company had suddenly closed down, she said, “I’m worried. What would we do if (the remaining company) stops delivering? What if they go out of business, too?”

In another household, a mother explained she was consistently concerned that the family’s tank would suddenly run dry. “You have to watch it all the time,” she said. “Sometimes, it lasts three weeks. Sometimes it’s gone in just a few days.” The water-hauling company could not be trusted, she explained, and they often brought less than the 2,500 gallons for which the family paid. The mother further explained that if the water depletes, the pump runs until it burns out, meaning she constantly has to monitor it. “Sometimes, you call (the water-trucking company), and they don’t answer or they can’t come.” Consequently, her family has gone without hauled water for days: no shower, no dishes, no washing clothes. “In the summer, when it gets hot, it can be very hard.”

In another household, a grandmother told me the family’s truck for hauling water required constant monitoring and maintenance. As it pulled into the backyard one afternoon, the 1994 Ford Ranger strained under the weight of the heavy water tank, which, when full, weighs more than a ton. She explained that her family feared the old truck’s days were numbered: “We are always worried that our truck will break,” she said. “If the truck stops working, what will we do then? This is how we get water. We can’t afford to pay (the water-hauling company).”

These descriptions of water insecurity portray how lack of access to reliable water services keeps Cochran residents in states of water precarity. Combined with economic injustices and other hardships detailed above, they point to the urgent need for ensuring Cochran residents receive water services. To that end, this report now turns to the two primary barriers standing between Cochran residents and water. Finally, the report concludes with two suggested solutions.

Problem No. 1: Lack of jurisdiction

During interviews with local governmental officials and water utilities, it was ascertained that the Cochran community exists beyond all water jurisdictions, in a sort of no-man’s land. This has created a situation wherein no agency or institution claims responsibility for providing Cochran water. Cochran residents thus find it difficult to determine to which agency they should turn for important questions and concerns in their decades-long struggle for water services. As one resident put it to me, “They say we’re not from Horizon. They say we’re not from the city. They say that we’re nobodies. Nobody wants to claim us.” For their part, agencies, utilities, and institutions continually deflect responsibility, pointing to the fact that Cochran exists beyond their service areas.

Solution: The County of El Paso Texas, El Paso Water Utility, Lower Valley Water District, and Horizon Regional Municipal Utility District should convene a meeting to determine once-and-for-all which agency will a) sponsor Cochran for funding for a water project, and b) which utility will take responsibility for delivering water once that funding is secured. The El Paso County Regional Water and Wastewater Service Plan, published in April 2017, has already offered guidance in this matter. That document points out that Horizon MUD has water mains within close proximity of the unserved area, as discussed above, and that the county would also play a role in ensuring water delivery.

Problem No. 2: Lack of funding

During interviews it was also ascertained that the cost of delivering water to Cochran was "prohibitively expensive." Initial estimates from the County put the cost of running infrastructure from the nearby Horizon MUD hydrant at $1.6 million, with a cost-per-connection for 23 individual homes at more than $70,000. Cochran residents contest this number, pointing out that the water line is less than .3 miles away. Moreover, this high cost-per-connection does not take into account the additional, undeveloped lots which could be serviced if a water line is extended. In all, the subdivision comprises 72 lots, which brings the cost-per-connection within the manageable range of $22,000. Value-engineering could potentially reduce the cost even more.

Solutions: Two important funding opportunities are potentially available for first-time water-service projects. First, under the Safe Drinking Water Act, the Environmental Protection Agency announced on April 29, 2019, the "Assistance for Small and Disadvantaged Communities Drinking Water Grant," which provides $42.8 million in funding this year. These funds are specifically earmarked for communities without safe drinking water; therefore, Cochran would be an ideal candidate. Information on the grants can be found on the EPA grant's webpage.

Second, State Representative Mary González, whose House District 75 encompasses numerous East El Paso colonias, including Cochran, introduced a bill (H.J.R. 11) that would revive the Economically Distressed Areas Program (EDAP) with some $200 million in funding. EDAP has historically offered an important funding mechanism for water projects in *colonias* like Cochran. H.J.R. 11 has cleared the Texas House of Representatives. As a constitutional amendment, the bill will be submitted to voters on Nov. 5, 2019. Residents and local politicians should express support for this bill. More importantly, if the resolution passses, local government and utilities should sponsor Cochran to pursue EDAP funding to ensure Cochran residents receive water.

Cochran Water-Insecurity Report: (Spanish Version)

Asegurando el agua para una comunidad desatendida del Condado de El Paso: Informe sobre las necesidades de agua, dificultades económicas y posibles soluciones para Cochran Mobile Park.

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La comunidad de Cochran Mobile Park está constituida de 23 casas al este del Condado de El Paso. La subdivisión se formó en la década de 1980 después de que William B. y Margaret S.

Cochran compraron el terreno del condado y lo fraccionaron en lotes para su venta. A pesar de que ha existido desde los inicios de la década de 1980, la comunidad Cochran todavía no cuenta con servicios básicos de agua y alcantarillado.

Las investigaciones para este informe se llevaron a cabo de febrero a mayo del 2019 con el fin de determinar por qué la comunidad de bajos ingresos todavía no tiene acceso al agua, cómo funciona la comunidad en esa situación tan precaria de agua y qué se podría hacer para proporcionarle acceso al agua. Durante las entrevistas, se confirmó que ya existe una red de servicios de agua en la comunidad cercana de Agua Dulce. Esta red de agua que es administrada por el Distrito Regional de Servicios Municipales de Horizon termina dentro de un tramo de tres décimas de milla de la comunidad desatendida de Cochran. Para este informe se entrevistó a muchos residentes de Cochran quienes expresaron su firme deseo que se extienda esta corta distancia de la red de agua para que sus familias puedan así disfrutar de un acceso confiable al agua potable.

Ante tales circunstancias, este informe expone tres conclusiones principales:

1) A pesar de que utilizan menos agua que el promedio de los paseños, los residentes de bajos recursos de Cochran pagan mucho más por el agua de menor calidad y todo esto con el fin de satisfacer sus necesidades más básicas de agua;

2) Los residentes de Cochran dieron a conocer muchas de sus dificultades que van más allá de la carga económica que representa obtener agua para sus necesidades básicas; y

3) Al incumplir con la entrega de agua confiable a los residentes de Cochran, las instituciones gubernamentales y sociales mantienen a los residentes de bajos recursos en situaciones precarias de agua, además de arraigar y reproducir ciclos de pobreza y de desigualdad.

Estableciendo dichas conclusiones, este informe finaliza determinando los obstáculos para la entrega de agua a Cochran y las posibles soluciones que garantizarán que todos los residentes del condado de El Paso tengan acceso a agua limpia y confiable.

Primera conclusión: Economía del agua por hogar--Cochran comparado con El Paso

Una encuesta de ingresos realizada en el año 2016 por el condado de El Paso reveló que todos los hogares de Cochran obtienen ingresos clasificados como “bajos” o “muy bajos”. [1] Esta parte del análisis demuestra como los residentes de bajos ingresos pagan mucho más por sus servicios mensuales de agua que el promedio de los paseños- a pesar de que los residentes de Cochran reciben agua que no es potable y utilizan mucho menos agua que el promedio de los paseños.

La mayoría de los hogares encuestados - 9 de 12- informó haber obtenido agua comprándola de una compañía repartidora de agua, la cual surte el agua en sus casas y la deposita en tanques en su patio. Las tres casas restantes obtenían el agua manejando a casas de amigos y/o familiares en colonias cercanas, llenaban los tanques con mangueras de jardín y acarreaban el agua a sus casas- una práctica informal conocida como “uso compartido del agua”. Cada vivienda entrevistada reportó que no bebían el agua que acarreaban, sino que la usaban para otros fines relacionados con el agua, como lavar trastes y ropa, bañarse, descargar inodoros, regar plantas y para los animales domésticos. Los residentes comentaron que no bebían el agua que acarreaban por temor a que se hubiese contaminado ya sea en el proceso de acarreo o del almacenamiento en los tanques difíciles de limpiar colocados afuera de sus casas. Por una parte, esto significó que los residentes de Cochran no reportaron ninguna enfermedad relacionada con el consumo de agua.

[1] 2016 TxCDBG Survey Questionnaire - Cochran Mobile Park

Por la otra, los residentes de Cochran pagaban una cantidad extra por agua de calidad potable que venía a manera de agua embotellada y/o en galones de cinco litros de agua.

De los nueve hogares entrevistados que pagaban a una empresa repartidora de agua, 7 eran familias de tres personas o más. Estas familias comentaron haber recibido una o más cargas de agua por mes, mientras que las otras dos casas que se integraban de uno y dos miembros por familia respectivamente, recibieron agua con mucho menos frecuencia -en ambos casos, una carga cada tres meses. La Tabla 1 muestra el costo mensual de agua estimado para las 7 familias de Cochran familias que compran el reparto de agua de manera regular, por mes. Para estas 7 familias, el costo promedio mensual-que incluye reparto de agua, agua no potable y agua embotellada para beber- es de $155.

Tabla 1: Costo mensual de agua para las familias Cochran por el reparto de agua en forma regular.

Familia	Tamaño del hogar	Reparto/mes	Costo/plazo	Costo de agua potable	Costo total de Agua/Mes
Familia 1	3	2	$60	$30	$150
Familia 2	5	2	$75	$32	$182
Familia 3	No aplica	1	$70	$30	$100
Familia 4	8	2.5	$75	$40	$227.50
Familia 5	No aplica	2	$75	No aplica	$150
Familia 6	6	1	$65	$30	$95
Familia 7	4	2	$75	$30	$180

Con $155 por mes, la familia promedio de Cochran paga mucho más por agua que una familia promedio de El Paso la cual paga $57.95 (El Paso Times 2018). [2] Una familia de Cochran informó de un recibo mensual del agua de $227 al mes, casi cuatro veces lo de un recibo promedio de agua en El Paso. Mientras que los clientes a quienes ofrece sus servicios la compañía El Paso Water Utility reciben agua de calidad potable, los residentes de bajos recursos de Cochran pagan más por agua de menor calidad. Aún más, los residentes de Cochran utilizan mucho menos agua que las viviendas promedio de El Paso. Por ejemplo, una vivienda de Cochran que recibe dos cargas de agua de camiones de reparto por mes consume alrededor de 5,000 galones, mas unos 50 a 100 galones adicionales de agua potable por mes. De acuerdo con el Texas Water Development Board, el consumo residencial per cápita en El Paso es de 86 galones por persona al día (gppd) [3]. En base a esta cifra, el consumo residencial promedio en una vivienda de cuatro personas en El Paso es de 10,664 galones por mes. Por lo tanto, el grado de injusticia económica que se relaciona con los recibos de agua en Cochran puede resumirse de la siguiente manera: **comparado con una**

[2] Kolenc, Vic. 2018. Water rates rising about $4 per month for El Paso homes just as other utilities increase. *El Paso Times. Jan. 10, 2018*

[3] Texas Water Development Board, Region C Water Planning Group

vivienda promedio de cuatro personas en el área de servicio de El Paso Water Utility, las familias Cochran pagan en promedio 2.6 más veces por agua de menor calidad y reciben menos de la mitad del suministro por esa cantidad.

Segunda Conclusión: Dificultades para satisfacer las necesidades básicas de agua

Durante las entrevistas, los residentes hablaron sobre la cantidad de dificultades que se relacionan para satisfacer sus necesidades básicas de agua que van más allá de las injusticias económicas descritas anteriormente. Once de los doce residentes entrevistados expresaron algún grado de frustración por el hecho de que han vivido en una comunidad- muchos por más de 20 o 30 años-sin acceso al servicio de agua. Entre los problemas que se mencionaron durante las entrevistas se incluyen las siguientes:

- Preocupación de que los niños estuvieran creciendo sin acceso a una infraestructura de agua potable;
- Preocupación de que el costo del reparto de agua por camiones siga aumentando;
- Enorme cantidad de tiempo que se pierde para abastecer el agua;
- Estrés que surge del temor de que se acabe el agua de los tanques;
- Complicaciones físicas para personas de la tercera edad a causa del acarreo, reparto y transporte del agua;
- Problemas para mantener las bombas y conservar los tanques limpios en el exterior;
- Frustración de que falta del servicio de agua haya dejado el área en un estado de semi-abandono a tal grado que los residentes de las áreas aledañas tiran frecuentemente basura y animales muertos;
- Decepción de que el paisajismo como árboles y jardines no puedan sobrevivir en el área por la falta de agua;
- Y falta de confianza en la compañía repartidora de agua pues de acuerdo con los residentes, les llena sus tanques con menos de los 2,500 galones que pagan.

Tres de las 12 viviendas entrevistadas dependen únicamente del agua que abastecen por su propia cuenta.

Los residentes involucrados en esta práctica informal del "uso compartido del agua" manejaban una vez por semana y/o diariamente a la casa de amigos/familiares cercanos a su comunidad para llenar los tanques de agua y llevarlos de regreso a su casa. Estos viajes representan un alto precio en cuestiones de tiempo, complicaciones físicas y estrés mental. Por ejemplo, una de las abuelas comentó que le dolía la espalda por manejar las pesadas bombas, cargar los tanques y las mangueras de un lado a otro y vaciar el agua en su lavadora. (Para ahorrar agua, conecta el desagüe de la lavadora a un barril, después vuelve a poner esa agua en la lavadora para otra lavada, de esta manera, lava dos cargas de ropa con esa misma agua, antes de vaciarla para regar sus árboles afuera). Comenta que de agua para beber gasta alrededor de $100 al mes en recipientes de cinco galones y agua embotellada. Cada fin de semana cuando no están en la escuela o en el trabajo, los miembros de su hogar, que son 12, hacen entre 4 y 8 viajes a colonias cercanas para llenar los tanques con agua. Tal como ella lo explicó, estos viajes consumían casi todo el fin de semana. "El tanque toma 45 minutos en llenarse con una manguera", explicaba, pero si no lo hacemos, ¿cómo tendríamos agua?

Tercer Resultado: Mantener a las familias en situaciones precarias de agua

Los residentes explicaron que sus conexiones de agua estaban sujetas a frecuentes cortes e interrupciones del servicio. Sin un acceso confiable y continuo al agua, las familias de Cochran viven en un estado de inseguridad del agua, pasando en ocasiones muchos días sin tener agua para bañarse, lavar los trastes y la ropa. Por ejemplo, muchos de los residentes explicaban que el costo del surtido de agua comenzó a aumentar drásticamente cuando cerró su negocio uno de los repartidores de agua en quien confiaban. "Solían ser $30, después $40, $50, $60 y ahora pagamos $75 por (cada carga de) agua", comentó otro de los residentes. "Cuando la otra compañía cerró, fue cuando los precios se dispararon" dijo otro residente. "Comenzaron a cobrarnos más. Es un monopolio". Una madre de familia expresó su preocupación de que casi toda la comunidad dependía del agua de una compañía. "Estoy preocupada", dijo. "¿Qué vamos a hacer si (la compañía que queda) deja de surtir agua? "¿Qué pasará si ellos también cierran su negocio?"

En otra vivienda, una madre de familia comentó que casi siempre estaba preocupada por el tanque de su familia. "Siempre tienes que estar al pendiente" dijo. "Algunas veces, nos dura tres semanas, algunas veces se acaba en pocos días". No se puede confiar en las compañías que surten el agua, comentó y por lo general traen menos de los 2,500 galones por los que paga la familia. Y más en detalle explicó que si el agua se agota, la bomba se desgasta hasta que se quema, lo cual significa que tiene que monitorearse constantemente. "Algunas veces, uno llama a la (compañía repartidora de agua) y no le contestan o no pueden venir". Como resultado, la familia ha estado sin agua durante días: sin bañarse, sin lavar trastes, sin lavar ropa. "En el verano, cuando hace calor, puede ser muy difícil".

En otra de las viviendas, una abuela me dijo que la camioneta de la familia encargada de transportar el agua requería de constante supervisión y mantenimiento. Una tarde mientras se metía al patio, la Ford Ranger 1994 se venció con el peso del pesado tanque de agua, el cual cuando está lleno pesa más de una tonelada. Comentó que su familia temía que los días de la camioneta estuvieran contados: "Siempre nos preocupa que se descomponga la camioneta" dijo. "¿Qué vamos hacer si la camioneta deja de funcionar? Esta es la única manera en que obtenemos agua, no podemos pagar (una compañía repartidora de agua)".

Estas descripciones de la inseguridad del agua reflejan como la falta de acceso a servicios de agua confiable mantiene a los residentes de Cochran en estado de precariedad de agua. Combinado con las injusticias económicas y otras dificultades que se explicaron anteriormente, señalan la urgente necesidad de asegurar que los residentes de Cochran reciban los servicios de agua. Con este propósito, este informe se enfoca ahora en las dos principales barreras que existen entre los residentes de Cochran y el agua y las soluciones que se sugieren.

Problema No. 1: Falta de jurisdicción

Durante las entrevistas con funcionarios del gobierno local y la oficina de servicios de agua, se determinó que la comunidad Cochran existe más allá de las jurisdicciones del agua, en una especie de tierra de nadie. Esto ha ocasionado una situación donde ninguna agencia o institución se hace responsable de proporcionar agua a Cochran. Por lo tanto, a los residentes de Cochran les cuesta trabajo determinar a cuál agencia deben dirigirse sobre cuestiones y asuntos importantes en su lucha, a lo largo de décadas, por el servicio de agua. Tal y como me lo dijo uno de los residentes "Ellos dicen que no somos parte de Horizon, dicen que nosotros no somos de la ciudad, dicen que no somos de nadie, nadie quiere que seamos parte de ellos". Por su parte, las agencias, los servicios públicos y las instituciones evaden continuamente la responsabilidad, enfatizando el hecho de que Cochran está fuera de sus áreas de servicio.

Solución: El condado de El Paso Texas, El Paso Water Utility, el Distrito de Agua del Valle Bajo y el Distrito Regional de Servicios Municipales de Horizon deben citar a una reunión para determinar de una vez por todas a) cuál agencia va a patrocinar a Cochran con los fondos para un proyecto de agua y b) cuál institución se hará responsable de la entrega de agua mientras que se aseguran los fondos. El plan de El Paso County Regional Water and Wastewater Service [4], publicado en abril del 2017, ya ha proporcionado una guía sobre esta cuestión. El documento señala que Horizon MUD tiene tomas de agua relativamente cercanas al área desatendida y como se comentó previamente, el condado también tendría una función para garantizar la entrega de agua.

Problema No. 2: Falta de fondos

Durante las entrevistas también se determinó que el costo del reparto de agua a Cochran era "extremadamente caro". Los cálculos iniciales del condado estiman en $1.6 millones el costo del funcionamiento de la infraestructura cerca de la red de hidrantes de Horizon MUD, con un costo de conexión para 23 viviendas particulares a más de $70,000. Los residentes de Cochran cuestionan esta cantidad, señalando que la red de agua está a menos de .3 millas de distancia. Además, este alto costo por conexión no toma en cuenta los terrenos adicionales sin desarrollar a quienes se les podría ofrecer el servicio si se extiende la red de agua. En total, la subdivisión abarca 72 terrenos, lo que determina el costo por conexión dentro de un rango manejable de $22,000. Un análisis de valor podría reducir aún más el costo.

Soluciones: Existen dos oportunidades importantes que pudieran estar disponibles para proyectos de servicio de agua que se realizan por primera vez. Primero, bajo la Ley de Agua Potable Segura/ Safe Drinking Water Act, la Agencia de Protección Ambiental anunció el 29 de abril del 2019, "el Subsidio de asistencia de agua potable para comunidades pequeñas y desprotegidas" que ofrece fondos por $42.8 millones este año.[5] Estos fondos se destinan exclusivamente para las comunidades sin agua potable; por lo tanto, Cochran sería un candidato ideal. Se puede obtener información sobre los subsidios en la página web EPA grant's webpage.

Segundo, Mary González representante del estado, cuya cámara del estado por el Distrito 75 abarca numerosas colonias del este de El Paso, incluyendo Cochran, propuso una ley (H.J,R 11) que reviviría el Programa para áreas desfavorecidas económicamente (EDAP, por sus siglas en inglés) con fondos por algunos $200 millones.[6]. El programa EDAP ha ofrecido históricamente un importante mecanismo de fondos para proyectos de agua en colonias como Cochran. La H.J.R 11 ha sido aprobada por la Casa de Representantes de Texas y el 5 de noviembre del 2019 será presentada a los votantes como enmienda constitucional. Los residentes y los políticos locales deben expresar su apoyo a esta ley. Todavía más importante es el hecho de que si se aprueba la resolución, el gobierno local y el servicio de agua deberán patrocinar a Cochran para conseguir los fondos de EDAP con el fin de garantizar que los residentes de Cochran reciban agua.

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[4] Border Environment Cooperation Commission. 2017. El Paso County Regional Water and Wastewater Service Plan.

[5] EPA. 2019. "Building the Capacity of Drinking Water Systems: WIIN Grant: Assistance for Small and Disadvantaged Communities Drinking Water Grant."

[6] González, Mary. TX H.J.R. 11.

EDAP Campaign Fact Sheet:

What are the benefits of water infrastructure? A case study of Socorro and San Elizario, Texas

Background: In 2003, a water and sewer infrastructure project was completed in Socorro and San Elizario, TXs, improving water and sanitation services for about **3,378 residents and businesses.** For most, this was a first-time connection to sewer and water. After the project's completion, UTEP researchers conducted an **extensive assessment of the impacts.**[1] Here is what they found…

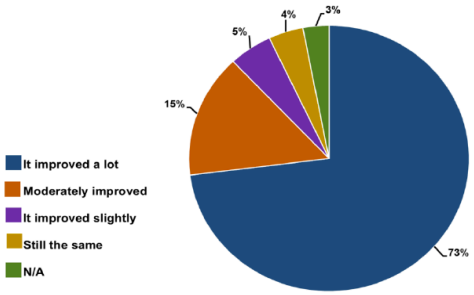
Water Sparked Economic Development

- **32% of residents reported more local jobs**
- **73% reported more local businesses, esp. restaurants**
- **69% reported more local shopping, esp. grocery stores**
- **83% reported more residential development/expansion**

Water Helped the Community Thrive

How did getting water help your community?	% of respondents
Water benefitted the community overall	96
Water expanded health care services	86
Water expanded local businesses (esp. restaurants, food services	84
Water improved fire safety	82
Water expanded parks and other recreation opportunities	78

Water Improved Quality of Life



Water Bolstered Health

After water and sewer infrastructure, residents reported fewer incidents of:

- **Hepatitis A**
- **Gastrointestinal illnesses**
- **Stomach infections, bleeding ulcers**
- **Neuropathy**
- **Skin Irritation/Infections**

[1]Hargrove, W.L., and M. Del Rio. 2017. Water Matters: A Retrospective Health Impact Assessment (HIA) of Water and Sanitation Infrastructure in Socorro and San Elizario, TX. Final Report to the Border Environmental Cooperation Commission. 68 pp. Available from CERM: Contact: wlhargrove@utep.edu

Template letters for Cochran residents to send to stakeholders:

Sample Letter for Water Utilities:

Dear Horizon MUD board members,

I am a member of the community at Cochran Mobile Park. As you know, we are an El Paso County community near Horizon MUD that does not have access to reliable water or sewer service. I am reaching out because new opportunities are opening up for us to potentially get water, and we need a sponsor to get funds for the project. I am asking Horizon MUD to sponsor us so we can receive funds for the project.

This November, Texas voters will decide if the Economically Distressed Areas Program will be funded with $200 million from the legislator. It has come to my attention through conversations with Rep. Mary Gonzalez's office that in order to be considered for funding, Cochran Mobile Park needs a sponsor. As a community near the Horizon MUD water districts (yours is the closest water main to my neighborhood), we are asking that you sponsor us for this project.

Currently, there is a water main managed by Horizon MUD less than .25 miles from Cochran Mobile Park. It should not cost too much to simply connect that line and run water pipes to our community. Doing so would relieve substantial financial, health, time, and stress burdens for my family and community. A UTEP student did a report on these burdens, attached for your records.

Please get back to me to let us know what we can do to get a sponsor for a water project at Cochran Mobile Park.

Thanks,

[Resident Name]

Sample Letter for State Representatives:

Dear Rep. [Representative's Name],

I am a member of the community at Cochran Mobile Park. As you know, we are an El Paso County community located in your district that does not have access to reliable water or sewer service. I am reaching out because we appreciate your work with the House bill to fund the $200 million for the Economically Distressed Areas Program. Cochran Mobile Park would be an ideal candidate for those funds. We have been here since the 1980s and never had water service. We are also low-income residents. For these reasons, we are asking that--if and when the funding becomes available--Cochran be considered for a water project.

We have heard that there is a list of potential communities that could receive funding if the voters approve the Prop 2 ballot and that Cochran is not on that list. We would like to be included on the list. What can we do to ensure that we are included on the list?

Currently, there is a water main managed by Horizon MUD less than .25 miles from Cochran Mobile Park. The Lower Valley Water District also has a water tank and water main that is very close to my community. It should not cost too much to simply connect either of those lines and run water pipes to our community. Doing so would relieve substantial financial, health, time, and stress burdens for my family and community. A UTEP student did a report on these burdens, attached for your records.

I understand the Cochran Mobile Park needs a sponsor to receive the funds. Do you have any advice on how to find a sponsor? I am ready and willing to help facilitate a water project using the proposed EDAP funding.

Please get back to me to let us know what we can do to get a sponsor for a water project at Cochran Mobile Park.

Thanks,

[Resident Name]

Sample Letter for El Paso County Commissioners:

Dear [County Commissioner's Name],

I am a member of the community at Cochran Mobile Park. As you know, we are an El Paso County community within your district that does not have access to reliable water or sewer service. I am reaching out because new opportunities are opening up for us to potentially get water, and we need a sponsor to get funds for the project. I am asking the County Commissioners to sponsor us so we can receive funds for the project.

This November, Texas voters will decide if the Economically Distressed Areas Program will be funded with $200 million from the legislator. It has come to my attention through conversations with Rep. Mary Gonzalez's office that in order to be considered for funding, Cochran Mobile Park needs a sponsor. As a community outside the boundaries of Horizon and Lower Valley Water districts, we are turning to the County itself, and the commissioners who represent us, and asking that you sponsor us for this project.

Currently, there is a water main less than .25 miles from Cochran Mobile Park. It should not cost too much to simply connect that line and run water pipes to our community. Doing so would relieve substantial financial, health, time, and stress burdens for my family and community. A UTEP student did a report on these burdens, attached for your records.

Please get back to me to let us know what we can do to get a sponsor for a water project at Cochran Mobile Park.

Thanks,

[Resident Name]

Questions for administrators, politicians, agency staff

What are the obstacles to providing colonias with water and sanitation services?
How has your agency/organization been involved in attempting to provide water and sanitation services to colonias?
Why is it important to provide colonias with water and sanitation services?
What are some of the funding mechanisms by which water and sewer projects are developed in colonias?
Has funding for such projects showed a trend of incline or decline over the past 20 years?
Can you walk me through the policy measures that your agency/organization has implemented to address the issues of water and sanitation services in colonias?
What are some of the current policy measures that are under consideration for this issue?
What is your agency/organization's prioritization process for water and wastewater development projects?
Would it be accurate to describe the majority of the colonias lacking water services as small and remote? If so, how do these characteristics factor into the approval process for water and sanitation projects?
Does your organization consider decentralized water services projects, such as rainwater harvesting or decentralized, small-scale waste treatment for colonias?
What has been you/your agency's involvement in the community project to provide water services for Cochran Mobile Park colonia?
Why does Cochran still lack water services? What have been the obstacles encountered?
What policies, funding agencies, grant programs, loan programs, etc. might Cochran be able to turn to in order to get water services?
Are there current estimates as to how much it would cost to supply Cochran with water?

What would be the obstacles to decentralized water services for Cochran and communities like it? Would decentralized services be a viable solution, alternative, or supplement?
Are there any policies to support projects like rainwater harvesting, decentralized wastewater treatment, and/or community water-conservation education?
Without decentralized options, does it seem likely that Cochran would ever get conventional water services?

Soft Path Survey:

Nombre:

Numero de telefono:

Fecha:

Servicios de Agua: tecnologías y estrategias

Por favor, clasifique las siguientes servicios de agua, tecnologías, y estrategias basado en si lo usas o no. Si no lo usas, por favor elegir si estas interesado a usar las en el futuro.

I. Suministro de agua: estrategias y tecnologías

¿Usa lo siguiente?

1. Agua del municipio (como tuberías, desagüe, drenaje, plantas centralizadas, etc.)

Si, lo tengo.
No, no lo tengo.
Si escogiste 'no,' ¿te interesa esta forma de conseguir agua? Si o No.

2. Sistema de captura de lluvia

Si, lo tengo.
No, no lo tengo.
Si escogiste ‘no,’ ¿te interesa esta forma de conseguir agua? Si o No.

4. Cabeza de ducha de bajo consumo (para reducir el uso agua)

Si, lo tengo.
No, no lo tengo.
Si escogiste ‘no,’ ¿te interesa esta tecnología para reducir el uso de agua? Si o No.

5. Duchas de dos minutos

Si, uso esta estrategia.
No, no lo uso.
Si escogiste ‘no,’ ¿te interesa esta estrategia para reducir el uso de agua? Si o No.

6. Llave de bajo consumo para fregaderos en la concina y baño (con aireador)

Si, lo tengo.
No, no lo tengo.
Si escogiste ‘no,’ ¿te interesa esta tecnología para reducir el uso de agua? Si o No.

7. Filtro bajo del fregadero (para purificar el agua del fregadero)

Si, lo tengo.
No, no lo tengo.
Si escogiste ‘no,’ ¿te interesa esta tecnología para purificar el agua del fregadero? Si o No.

II. Tecnologías y estrategias para ahorrar agua afuera de la casa

8. Irrigación goteado

Si, lo tengo.
No, no lo tengo.
Si escogiste ‘no,’ ¿te interesa esta tecnología para reducir el uso de agua? Si o No.

9. Mantillo (Pedazos de madera en la tierra abajo de árboles y plantas para conservar la humidad del agua y reducir evaporación)

Si, uso esta estrategia para reducir el uso de agua afuera.
No, no lo uso.
Si escogiste 'no,' ¿te interesa esta estrategia para reducir el uso de agua? Si o No.

10. Solo usa árboles y plantas bien adaptados al desierto

Si, uso esta estrategia para ahorrar agua.
No, no lo uso.
Si escogiste 'no,' ¿te interesa esta estrategia para reducir el uso de agua? Si o No.

III. Aguas residuales estrategias/tecnologías

11. Desagüe convencional, del municipio (drenaje, desagüe centralizado)

Si, lo tengo.
No, no lo tengo.
Si escogiste 'no,' ¿te interesa esta forma de tirar aguas residuales? Si o No.

12. Inodoros (escusados) de bajo consumo (cuando bajas los desechos, usan menos agua)

Si, lo tengo.
No, no lo tengo.
Si escogiste 'no,' ¿te interesa esta forma de reducir el uso de agua? Si o No.

13. Poniendo piedras en el tanque del inodoro (escusado) para reducir el uso del agua

Si, uso esta estrategia.
No, no lo uso.
Si escogiste ‘no,’ ¿te interesa esta estrategia para reducir el uso de agua? Si o No.

14. Sistemas para usar ‘agua grises’ - (agua reciclada, desde lavandería al jardín o arboles)

Si, uso esta estrategia.
No, no lo uso.
Si escogiste ‘no,’ ¿te interesa esta estrategia para reducir el uso de agua? Si o No.

15. ‘Agua grises’ del fregadero al jardín o arboles

Si, uso esta estrategia.
No, no lo uso.
Si escogiste ‘no,’ ¿te interesa esta estrategia para reducir el uso de agua? Si o No.

16. ‘Agua gris’ del fregadero al inodoro (escusado)

Si, uso esta estrategia.
No, no lo uso.
Si escogiste ‘no,’ ¿te interesa esta estrategia para reducir el uso de agua? Si o No.

17. Inodoro (escusado) abonos orgánicos (compostaje)

Si, uso esta tecnología.
No, no lo uso.
Si escogiste ‘no,’ ¿te interesa esta estrategia para reducir el uso de agua? Si o No.

18. Fosa séptica

Si, uso esta tecnología.
No, no lo uso.
Si escogiste ‘no,’ ¿te interesa esta estrategia para reducir el uso de agua? Si o No.

IV. Tecnologías y estrategias al nivel de una comunidad

19. Sistemas de captura de lluvia - centralizados entre varios hogares

Si, uso esta tecnología en nuestra comunidad.
No, no lo uso.
Si escogiste 'no,' ¿te interesa esta estrategia para reducir el uso de agua? Si o No.

20. Sistemas para colectar y ahorrar aguas de tormentas (agua pluvial) (el agua que corre afuera en los calles después de una tormenta)

Si, usamos estas estrategias en nuestra comunidad.
No, no los usamos.
Si escogiste 'no,' ¿te interesa esta estrategia para conseguir más agua? Si o No.

21. Micro-plantas para el tratamiento y reusó de aguas residuales

Si, usamos esta tecnología en nuestra comunidad.
No, no los usamos.
Si escogiste 'no,' ¿te interesa esta tecnología para purificar aguas residuales y conseguir más agua? Si o No.

Semi-Structured Interview Questions (English)

1. Can you describe to me the process of how your household currently meets its water needs?

2. Prior to the rainwater-harvesting system, how were you obtaining and using water?

3. What do you use water for inside/outside of the house?

4. What are your overall impressions of the rainwater harvesting system now that it has been installed?

5. Have you had any issues with the system, such as maintenance, cost, labor, or other issues?

6. What sort of regular maintenance does the system require?

7. Have you found that the system has saved you time and/or money in any way?

8. Has the system reduced the number of trips you have to take to get water?

9. Does it rain enough here to fill up your tanks so that water is available when needed?

10. How do you use the rainwater collected?

11. How is the quality of the rainwater collected?

12. Does having the water supplied from the system help with any tasks related to animals,

gardening, or other jobs and/or chores around the house?

13. Does the system grant you greater control over your water supply?

14. What do your neighbors in the community think about the system?

15. Thinking back to before you had the system, has the water supplied caused you to change

any habits or pick up any new skills, hobbies, or the like?

16. Do you use more or less water now that the system has been installed?

17. Now that you have rainwater, do you feel that it is more important, less important, or

equally as important that the local government find a way to connect you to water services?

18. What would be your ideal water-supply situation?

19. What, in your opinion, are the limits to having rainwater harvesting as an alternative or

supplement to piped-water supply?

20. Would you recommend rainwater harvesting as a potential solution for people in situations

similar to their own?

Semi-Structured Interview Questions – (Spanish)

1. ¿Puedes explicar cómo tu familia tiene acceso a agua? ¿Cómo consiguen agua? ¿Cuáles son las diferentes maneras para conseguir agua?

2. Antes de que tuvieran el sistema de captura de lluvia, ¿cómo conseguían el agua? (¿Cuánto pagaban por el agua que acarreaban ustedes o que venía por las pipas ? ¿El agua que recibían era potable/segura de consumir?)

3. ¿Para que usan el agua adentro y fuera del hogar?

4. ¿Qué piensas sobre el sistema de captura de lluvia?

5. ¿Has tenido algún problema con el sistema de captura de lluvia? Por ejemplo, con el mantenimiento, el costo, el labor, u otros problemas (canaletas, pipas, llaves, o tanque)

6. ¿Qué tipo de mantenimiento le da a su sistema de captura de lluvia? ¿Cómo mantienen limpio el sistema de captura de lluvia? ¿Cómo mantienes limpio los tanques?

7. ¿Crees que el sistema de captura de lluvia te ha ahorrado tiempo y dinero? Si es si, ¿Cómo?

8. ¿Crees que el sistema de captura de lluvia ha reducido el número de viajes que tienes que hacer para conseguir/acarrear agua?

9. Antes de que tuviera el sistema de captura de agua, ¿se estresaba o se preocupaba por conseguir agua? Si es si, ¿cree que el sistema de captura de lluvia le ayuda a bajar su nivel de estrés relacionado con conseguir agua?

10. ¿Tiene suficiente lluvia para llenar los tanques? (¿En cuales meses del año se llenan los tanques?)

11. ¿Cuál es la calidad del agua que sale del sistema de captura de lluvia? ¿Usa esta agua para beber? Si es si, ¿hierve el agua antes de beber?

12. Piensas que, con el sistema de captura de agua, ¿puedes manejar más tu consumo de agua?

13. ¿Qué piensan tus vecinos sobre el sistema de captura de lluvia?
14. ¿Ha cambiado su consumo, o maneras como utiliza el agua ahora que tiene el sistema de captura de lluvia? ¿Ha aprendido nuevas habilidades? ¿Usa más o menos agua?

15. Ahora que tienes agua del sistema de captura de lluvia, ¿Qué tan importante para ustedes que su hogar y su comunidad se conecte al agua de municipio (Como un tanque central, tuberías, y desagüe)?

    Más importante, menos importante, o igual de importante

16. ¿Cuál sistema de agua sería ideal para usted?

17. ¿Cuáles son algunas limitaciones de tener sistemas de captura de agua?

18. ¿Recomendarías el sistema de captura de lluvia para otra gente que vivan en situaciones similares?

IRB Consent Forms:
Consentimiento Informado: Entrevista

Mi nombre es Chilton Tippin, y soy investigador de la Universidad de Texas en El Paso (UTEP). Estamos haciendo un estudio de todo lo relacionado con el agua (proveedor de agua, tipos de recipientes para guardar el agua, filtros, etc.) y saneamiento en los hogares. Esta investigación está financiada por el Departamento de Agricultura de los EU (U.S. Department of Agriculture). Como parte de este estudio, le pediré su cooperación para responder una serie de preguntas y contestar un breve cuestionario. Esta entrevista tomará una hora más o menos. Su participación ayudará al grupo de investigadores a conocer el acceso al agua y las prioridades y preocupaciones del agua de las personas en esta comunidad.

El beneficio de participar en esta entrevista es que se obtendrá información útil para su comunidad. Usted no recibirá un beneficio personal. El riesgo de participar en esta entrevista es que usted pueda inadvertidamente mencionar algo que usted prefiera no hablar. Usted puede pedirme que quite/borre cualquier información de usted en nuestros registros. Esos riesgos son menores, y se parecen al riesgo de cualquier conversación. El único costo para usted es su tiempo, por el cual no recibirá compensación.

Para evitar algún daño, la información que nos proporcione será tratada con estricta confidencialidad. Todas las entrevistas, nombres, y lugares serán codificados con un número para proteger su identidad. Solamente esos códigos aparecerán en su entrevista y sin incluir información personal que lo identifique a usted. La lista de contactos de esta investigación se mantendrá separada de las entrevistas codificadas. Grabaremos esta entrevista en una grabadora y la analizaremos electrónicamente. Al firmar este documento, usted nos da permiso de que se grabe la conversación.

Tanto los registros de la entrevista como la lista de contactos serán encriptados (solo se pueden ver con código de acceso), en archivos separados, y bajo llave (en un aparato electrónico), en una oficina segura del Centro de Estudios Latinoamericanos y Fronterizos de UTEP. Los archivos se retendrán por 5 años a partir de la terminación del estudio con el propósito de mayor análisis, y después serán destruidos.

En cualquier documento público que resulte de esta investigación (publicaciones, documentos de políticas públicas, etc.), no usaremos su nombre, en su lugar usaremos un seudónimo (sobrenombre), y cambiaremos los detalles personales que inevitablemente puedan identificarle a usted o su posición, tal como ser miembro, su puesto, u otro rol dentro de una organización. Le mostraremos el borrador de lo que escribamos y que pueda representar su información o puesto, y la de su organización, y le daremos tiempo para revisarlo, aprobarlo, cambiarlo, o decirnos que no lo usemos.

Participar en este estudio es voluntario. Usted tiene el derecho de no participar y detener su participación en cualquier momento. También, usted puede solicitar que borremos su registro en el estudio. Rechazar participar en este estudio no implicará multas, castigos, ni solicitudes de compensación, beneficios o servicios. Usted tiene el derecho de que le respondan cualquier pregunta sobre la investigación o el proceso de la entrevista. Puede mandar sus preguntas al Dr. Joe Heyman en la University of Texas at El Paso, 915-747-8745 o jmheyman@utep.edu.

Firme abajo solamente si entiende la información acerca de esta investigación y elige participar. Asegúrese de que todas sus preguntas sean contestadas antes de firmar y de que entiende el propósito de esta investigación. Si tiene alguna pregunta acerca de sus derechos como participante en una investigación, usted puede llamar al UTEP Institutional Review Board (Comité de Revisión Institucional de UTEP) 915-747-7693. Le daremos una copia de esta forma firmada si usted decide tomar parte en esta investigación.

_____	_____
Firma del investigador	Firma del o la participante
_____	_____
Nombre	Nombre

_____ _____

Fecha de hoy Hora Fecha de hoy Hora

Consent Form: Interview

My name is Chilton Tippin, and I am a researcher from the University of Texas at El Paso. We are conducting a study of household water supplies and sanitation. This research is funded by the U.S. Department of Agriculture. As part of this study, I will be asking for your cooperation in responding to a series of questions, including a brief survey. This interview will take about one hour. Your participation will provide the research team with information on community access to water, and people's own goals for water.

The benefit of participating in this interview is useful information for your community, and you will not receive an individual benefit. The risk of participating in this interview is that you might inadvertently reveal something you prefer not to disclose. You can ask me to remove anything you want from the interview record. These risks are minor, and resemble those in ordinary conversations. The only cost to you of participation will be your time, which will not be compensated.

To prevent any harm, the information you will be providing will be treated with strict confidentiality. All interviews, names, and locations will be coded with a number to protect your identity. Only the number appears with the record of your interview, not any personally identifying information. The research contact list will be kept separately from the numbered interviews. We will record a digital audio file of the interview. By signing this consent, you give permission to be recorded. Both interview records and the contact list will be digitally encrypted, in separate files, and kept under lock and key (on an electronic storage device) in a secure room in the offices of UTEP's Center for Inter-American and Border Studies. Records will be retained for five years after the end of the project for further analysis, then destroyed.

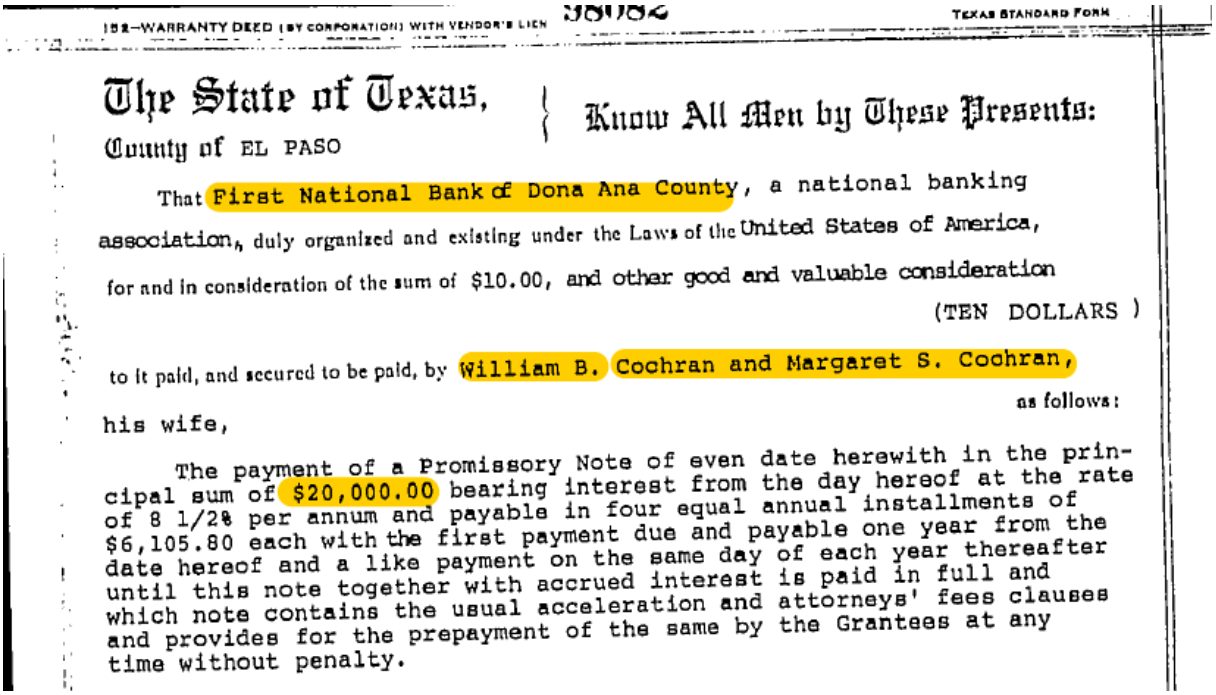
In any public document produced by this research project (publications, public policy documents, etc.), we will not use your name, instead using a pseudonym, and we will change personal details so you cannot be identified. If there are specific details that would unavoidably identify your information/position, such as your membership, job, or other role in an organization, we will provide you with a draft of what we will write that would represent you or your organization's information/position, and allow you to review, approve it, change it, or instruct us not to use it.

Taking part in this study is strictly voluntary. You have the right to not participate, to refuse to answer any questions if participating, to stop participation at any time, and to request that your interview record be removed from the study and destroyed. Refusal to participate will involve no penalties or loss of benefits/service. You have the right to have answered any questions about the research and the specific interview process. Questions should be directed to Dr. Joe Heyman at the University of Texas, El Paso at 915-747-8745 or jmheyman@utep.edu .

Sign below only if you understand the information given to you about the research and choose to take part. Make sure that any questions have been answered and that you understand the study. If you have any questions or concerns about your rights as a research subject, call the UTEP Institutional Review Board at 915-747-7693. If you decide to take part in this research study, a copy of this signed consent form will be given to you.

_____	_____
Researcher's Signature	Participant's Signature
_____	_____
Printed Name	Printed Name
_____	_____
Today's Date Time	Today's Date Time

Cochran chain of title documents



152—WARRANTY DEED (BY CORPORATION) WITH VENDOR'S LIEN 38082 TEXAS STANDARD FORM

The State of Texas, } Know All Men by These Presents:
County of EL PASO

That First National Bank of Dona Ana County, a national banking association, duly organized and existing under the Laws of the United States of America, for and in consideration of the sum of $10.00, and other good and valuable consideration (TEN DOLLARS) to it paid, and secured to be paid, by William B. Cochran and Margaret S. Cochran, his wife, as follows:

The payment of a Promissory Note of even date herewith in the principal sum of $20,000.00 bearing interest from the day hereof at the rate of 8 1/2% per annum and payable in four equal annual installments of $6,105.80 each with the first payment due and payable one year from the date hereof and a like payment on the same day of each year thereafter until this note together with accrued interest is paid in full and which note contains the usual acceleration and attorneys' fees clauses and provides for the prepayment of the same by the Grantees at any time without penalty.

WARRANTY DEED WITH VENDOR'S LIEN

Date: May 9th, 1991

Grantors: WILLIAM B. COCHRAN AND MARGARET S. COCHRAN

Grantors' Mailing Address:

Grantee: [redacted]

Grantee's Mailing Address: 3100 Frankfort, El Paso, Texas 79930

Consideration: TEN AND NO/100 DOLLARS ($10.00) and a note of even date that is in the principal amount of FORTY THOUSAND AND NO/100 DOLLARS ($40,000.00) and is executed by Grantee, payable to the order of WILLIAM B. COCHRAN AND MARGARET S. COCHRAN. The note is secured by a vendor's lien retained in favor of WILLIAM B. COCHRAN AND MARGARET S. COCHRAN in this deed and by a deed of trust of even date from Grantee to WILLIAM B. CROUT, Trustee.

Property:

Lot 2, Block 1; Lots 7 and 8, Block 1; Lots 1 through 7, Block 2; Lots 12 through 18, Block 2; Lots 1 through 8, Block 3; Lots 10 through 18, Block 3; Lots 1 through 18, Block 4; and Lots 1 through 9, Block 5, COCHRAN MOBILE PARK, an addition to El Paso County, Texas, according to the plat thereof on file in Volume 55, Page 56, Real Property Records, El Paso County, Texas.

VITA

Chilton Tippin was born in El Paso, Texas, and received a BA in journalism from Texas Christian University in Fort Worth, Texas. He worked for several years as a reporter in Laramie, Wyoming, where he won a statewide sweepstakes award for feature writing. In 2015, he walked from Mexico to Canada up the spine of the Rocky Mountains. Returning to El Paso, he engaged himself in environmental projects, such as rainwater harvesting and alternative farming. His research interests include public lands, conservation, sustainability, wild-and-scenic rivers, water insecurity, *colonias,* and environmental justice.