THE SOCIAL CONSTRUCTION OF WATER IN DOMINICA AND HOW IT HAS INFLUENCED USE AND EXPORTATION

by

Evelyn Pickering

A Thesis Submitted to the Faculty of the

SCHOOL OF ANTHROPOLOGY

In Partial Fulfillment of the Requirements

For the Degree of

MASTER OF ARTS

In the Graduate College

THE UNIVERSITY OF ARIZONA

2014

ProQuest LLC.
789 East Eisenhower Parkway
P.O. Box 1346
Ann Arbor, MI 48106 - 1346

STATEMENT BY AUTHOR

This thesis has been submitted in partial fulfillment of requirements for an advanced degree at the University of Arizona and is deposited in the University Library to be made available to borrowers under rules of the Library.

Brief quotations from this thesis are allowable without special permission, provided that an accurate acknowledgement of the source is made. Requests for permission for extended quotation from or reproduction of this manuscript in whole or in part may be granted by the copyright holder.

SIGNED: Evelyn Pickering

APPROVAL BY THESIS DIRECTOR

This thesis has been approved on the date shown below:

_____	December 2, 2014
Richard Stoffle Professor of Anthropology	Date

First and foremost, I would like to thank the University of Arizona School of Anthropology and Comins Native American Studies Fund for providing the funding that allowed this research to be conducted. A special thanks goes to Dr. Richard Stoffle for the years of mentorship and guidance in my education, my work, and my life. Dr. Mamadou Baro and Dr. James Greenberg, thank you for always providing insight and inspiration, and teaching me what it means to be an Applied Anthropologist. I would also like thank Dr. Kami Merrifield for support and guidance. Without the love and support of my parents and sister, Dr. Robert Pickering, Marianne Pickering, and Kate Pickering, none of this would have been possible. Miss Michelle Coe, thank you for being my best friend and without hesitation travelling with me to the beautiful island of Dominica. Finally, I would like to express my upmost appreciation to the people of Dominica who graciously welcomed me into their world and culture, and made this study a success.

Dominica has been recognized for its landscape containing hundreds of rivers and receiving high rainfall, and “our water belongs to the world," or so says many Dominican citizens, and their government. A schism exists in the understanding of the water resources of Dominica. Local perceptions are in conflict with regional climate change data. Where climate change research has found Dominica to be high risk for water quality and quantity, locals maintain the mindset that there is an overabundance of the resource. Local epistemologies influence governmental water management practices, which presently focus on exportation of the resource. In efforts of economic development, while trusting that there is a surplus of water, Dominica leases billions of gallons of water each year to foreign companies. A popular conception on the island is that there is an abundance of water, and therefore, it should be shared globally. This unique social construction of Dominican water has been a foundation leading to the sale of billions of gallons of fresh water to international corporations. However, the bulk exportation of water is occurring in the context of climate change, and thus, the availability of water will be impacted by changes in annual rainfall, sea level rise, increased temperatures, and more severe hurricanes. The purpose of this study is to gain a better understanding of how the social understanding of water in Dominica was constructed, and what this means in relation to resource exportation and climate change. This research-based paper explores Dominican perceptions of water abundance and sustainability.

Chapter One- Executive Summary

In this predominately Catholic country, any activity that engages in the distribution of goods that would otherwise go to waste is in some manner divinely sanctioned as an appropriately moral use of God's resources (Mantz 2007: 28).

Figure 1.1 Map of the Caribbean (Vacations To Go)

1.1-Introduction to Dominica

The Commonwealth of Dominica is an island in the Lesser Antilles of the Caribbean. It is located between Guadeloupe and Martinique (Figure 1.1). Compared to other places in the region, Dominica is relatively large with a low population. The

island has been recognized for its water resources, lush vegetation, and rare bird population (Figure 1.2). The economy has long been driven by agriculture; however, Dominica now also depends on ecotourism. Unlike other islands in the Caribbean, Dominica lacks sandy beaches, and therefore, there are not any large resorts. The island imports far more than it exports, so development and competiveness in the global market are key goals nationwide.

Figure 1.2 Kalinago Barana Autê, Saint David Parish, Dominica

In efforts to reach these development aspirations and stabilize the local economy, the Dominican government is currently pursuing new and alternative ways to harness and export the resources they do have in abundance. The island was formed through volcanic eruptions and has remained active, so there is a potential for producing geothermal energy and marketing it for international sales. Another 'untapped' natural resource that Dominica has in abundance is fresh water. Dominica currently relies on hydroelectricity for 40% of the islands total energy supply. According to background research and in-country interviews, bulk water exportation to foreign countries and visiting cruise ships has become a commonly accepted method of utilizing the resources to their full economic potential in Dominica. Within the local discourse, however, economic development is not the sole motivator for water exportation. Culturally, Dominicans feel a moral responsibility to share their abundant water resources, which have been described by respondents as a basic

necessity for life, with other places worldwide that are struggling because they lack a sufficient quality or quantity. This unique and generous cultural perspective adds complexity to the bulk water exportation process.

1.2-Research Problem

This study seeks to gain an understanding of their cultural significance, since the natural resources, like water, of Dominica are beginning to be consumed at a larger scale and in new ways. The purpose of this research is to document the cultural meaning of water, how Dominican people use it, how Dominican people feel about exporting water, and environmental or climatic changes Dominica has experienced recently. Together, the basic questions addressed in this study can begin to provide insight into the larger sociocultural impacts of future changes in the access and availability of water Dominican people will have after control over resources are managed and the climate changes. The research problem will be further discussed in Chapter Two- Literature Review, and the Research Methodology will be presented in Chapter Three. The topics listed below were fundamental in this study:

- Water Usage
- Perceived Water Availability
- Water Ownership
- Water Sales
- Common Knowledge of Exportation and Lease Agreements
- Environmental Predictability
- Environmental Change

1.2.1 Sub-Questions

The following five questions were developed from the primary research question, and have guided this study.

1. Do Dominicans have an accurate understanding of water in their environment?

2. Do Dominicans understand that global warming is causing climate change resulting in more frequent droughts?

3. Do the citizens of Dominica currently use water for personal use sustainably and still have a massive water surplus?

4. Do Dominicans hold an epistemological position that their surplus is a blessing that they are morally obligated to share with a more arid world?

5. Are water sales by Dominica to foreign businesses an appropriate action by the government, which manages the natural water as a common property of the Dominican people?

Each of these questions, as well as others, was addressed in formal interviews with 32 Dominican people.

1.3 Summary of Findings

The data that was collected sufficiently answered the research questions of this study. People in rural communities perceive and use more water types than rural respondents. There are many different types of water in Dominica, and these cultural perceptions influence how water is used. For example, sulfur water has medicinal purposes and rainwater is sometimes used for drinking in rural communities. In general, however, all Dominicans described the island as having an abundance of fresh water. Rural interviewees responded more frequently that they have experienced environmental changes. Dominicans felt morally responsible for sharing their water with other peoples who are experiencing a natural disaster or extreme poverty. However, most people also recognized the profitability of the resource for the nation. The majority of interviewees supported water exportation, but were divided between the ethical morality and economic incentives. Urban interviewees responded more frequently that they recognize the economic benefits of foreign water sales. Very few interviewees responded that they were aware of water currently being exported, and of those that were aware even fewer knew the specifics of how the water was leaving the island and where is was going. When asked if Dominica was experiencing climate change, many interviewees were unsure. However, when asked more specifically about changes to their land and because of recent weather patterns, the majority of people interviewed described decreased annual rainfall, inconsistent and unpredictable rainy and dry seasons, and more severe hurricanes. Most interviewees felt that if there were a drought in the future, water should not be exported, yet only a very few people responded that Dominica could ever be affected enough by water shortage that it would be something to raise concern. A complete description and analysis of the findings is provided in Chapter Four.

Chapter Two - Literature Review

Figure 2.1 Map of Dominica

Dominica (Figure 2.1) is an island unlike any other in the Caribbean. Dominica is an extremely mountainous volcanic island with its highest point of elevation reaching 1,447 meters (4,747 feet) (Advameg, Inc. 2013). At its widest point, the island is 24 kilometers, and is 48 kilometers long (15 miles by 30 miles) (John et al. 2001, xiii). The island's topography is generally steep, rugged, and heavily vegetated with the exception of a few flat regions located in river valleys and along the northeast coast (John et al. 2001, xiii). The topography of the island has created a climate of high rainfall (John et al.

2001, xv); “Dominica’s interior contains an extensive network of surface and underground water and is interspersed with rivers, waterfalls, and lakes. The island is widely reported to have 365 rivers, one for each day of the year. The ten largest rivers all have average annual flows of 10 million gallons per day” (John et al. 2001, xiv).

2.1 Guiding Questions

The following three questions guided the background research and data collection of this study.

1) How did this social construction arise?
2) How is the water sold?
3) To what extent does the concept of Dominican freshwater as a world resource persist as its availability shifts with climatic changes?

To contextualize these concepts, some more refined insights included in this discussion are:

- The colonial “tipping point”;
- Post-colonial pressure to develop an economy;
- The social construction of water;
- Water as national patrimony;
- The overall process, mechanics, and logistics of selling bulk freshwater; and
- Interview data about a local experience with this development and current perspectives on the endeavor.

2.2 Prehistorical and Historical Development of Dominican Resource Extraction

Throughout the prehistory and history of Dominica, its natural resources have attracted human use. The indigenous population of Dominica is generally referred to as Carib, however, these people choose to call themselves the Kalinago. The term Carib is derived from the myth that these people were cannibalistic and aggressive (Keegan 1996: 274). Archaeological evidence and oral history indicate that the island of Dominica had been utilized by Indian people for “millennia rather than centuries” (Rouse 1992, 46). Prehistoric migration patterns are complex, and many theories for the peopling of the Caribbean exist. According to Higman (2011: 9), the peopling of the Caribbean began around 7200 BP. Baker writes, “The pre-Columbian Caribbean can best be understood as a series of migrations up the Antillean chain. Various waves of Amerindian peoples migrated into the region from the South American coast, displaced and replaced on another, and left behind, to varying degrees, traces of their movements” (1994:18). This is the best-documented theory regarding human migration to this region. A contrasting theory argues that waves of migration from Southeastern North America moving north to

south down the archipelago. Due to sea level rise, evidence of this migration pattern is inaccessible; however, speculations would indicate much earlier dates of occupation.

It has been recorded in the archaeological record of Dominica that natural resources played a major role in habitation site selection. Most of the sites that have been studied on the island are located, "near the mouths of rivers or by springs in sheltered bays, on ground above flood level during heavy rains" (Honychurch 1995: 14). Water resources were not only sought after for drinking purposes, but would have also been selected for the fish, shellfish, and bird life that they support, which would provide food for indigenous populations. As was previously discussed, indigenous populations migrated via canoe, so they would have been attracted to certain landscapes or ecologies.

> Looking at the island through the eyes of hunter-gatherers, fisherman and early cultivators, particular zones stand out. The best reefs are located along the north-east coast from La Soye Point to Anse Soldat, around Scotts Head and at Toucari. The best canoe beaching areas would be along the sandy sheltered bas of the west coast and along the north-east. River estuaries such as Roseau, Canefield, Belfast, Layou, Batalie and the Indian River could even harbour canoes and rafts (Honychurch 1995: 14).

Water was necessary for survival for the first settlers of Dominica, and continued to be an attractive resource for the subsequent arriving populations.

Upon the arrival of Columbus in the Caribbean in 1493, Dominica's written history began. However, The Spanish first landed on Dominica in 1514 in search of water and wood to take to their other islands. At this initial point of contact, and then again in 1526, 1565, and 1567, the Spanish were violently attacked by the native populations (Baker 1994: 42). Apparently, "the rugged nature of Dominica's coastline and the hostility of its Amerindian inhabitants discouraged Spanish settlement" (Baker 1994: 42). After these initial attempts by the Spanish to extract resources failed, they left the island alone and native populations used Dominica for refuge. The Spanish would later tolerate the idea of Dominica as a place for native populations. With the exception of a few documented trade encounters, European colonizers largely avoided Dominica until 1635 (Luke 1950: 125).

The French were the first European colonizers of the island, which was auspiciously located between two other French colonies, Martinique and Guadeloupe. However,

> In 1660, largely on the advice of Father Philippe de Beaumont, who lived in Dominica for five years, sympathized with the Amerindians' plight, and argued that the island belonged to the Carib, the French and British

> governments decided to grant them exclusive rights to Dominica and St. Vincent “in perpetuity” (Baker 1994: 44).

Although indigenous peoples had land rights, French settlers continued to utilize the island. England was interested in gaining control of the island for control of Dominica’s resources and a strategic foothold in the Antillean chain. The British Empire increased its presence in 1756, and formally took the island in 1763 (Baker 1994; 51, 54). After several wars (in Europe) and failed treaties between France and Great Britain, “British control was formalized by the ninth article of the Treaty of Paris, 1763, which ceded Dominica to Britain” (Baker 1994: 54). There were, however, brief periods in 1795 and 1805 when France regained some power over Dominican trade (Baker 1994: 54).

In time, the British Empire took full control of Dominica and its natural resources. Baker states,

> Elsewhere in the Caribbean, sugar was king. Notwithstanding the fact, then, that the island had been singled out by the sugar lobby for its unsuitableness for this purpose, the British government, with some duplicity, attempted to lure settlers to Dominica with the promise of sugar plantations (1994: 58).

One way of maintaining this control was by increasing the population, and one way of increasing the population was to promote the opportunity for slave-based plantations producing sugar crops (Baker 1994: 58). This British tactic differed greatly from the previous ways French colonizers used the land, and was very problematic for the success of colonial crops. The island creates several issues for exporting crops. In fact,

> Of all the British ceded islands, Dominica presented the greatest environmental hindrances to rapid development. Its relief, inaccessibility, its mantle of gloomy cloudiness, together with the absence of suitable beaches from which cargoes could be lifted, did not encourage pioneering ventures into the interior, with the result that much of the island remained under dense rain-forest for another 150 years (Niddrie 1966: 76).

The flat fertile land that would be suitable for growing sugar is isolated to the northeast corner of the island, but the major port is located on the southwest coast. Steep mountains and unstable roads connect these two points, which made transferring the product difficult and inefficient. Baker states that, “almost all those who went to Dominica tried to take up sugar production, but, given the topography of the island, their prosperity was far from assured, and many returned home” (Baker 1994: 62). Failures associated with this approach of monocrop agriculture on the mountainous landscape, a war between France and England in 1778, damages caused by hurricanes in 1778 and 1780, and a fire in the capital in 1781 all contributed to the deterioration of Dominica's ability to be a profitable colony (Baker 1994; 65, 68, 71).

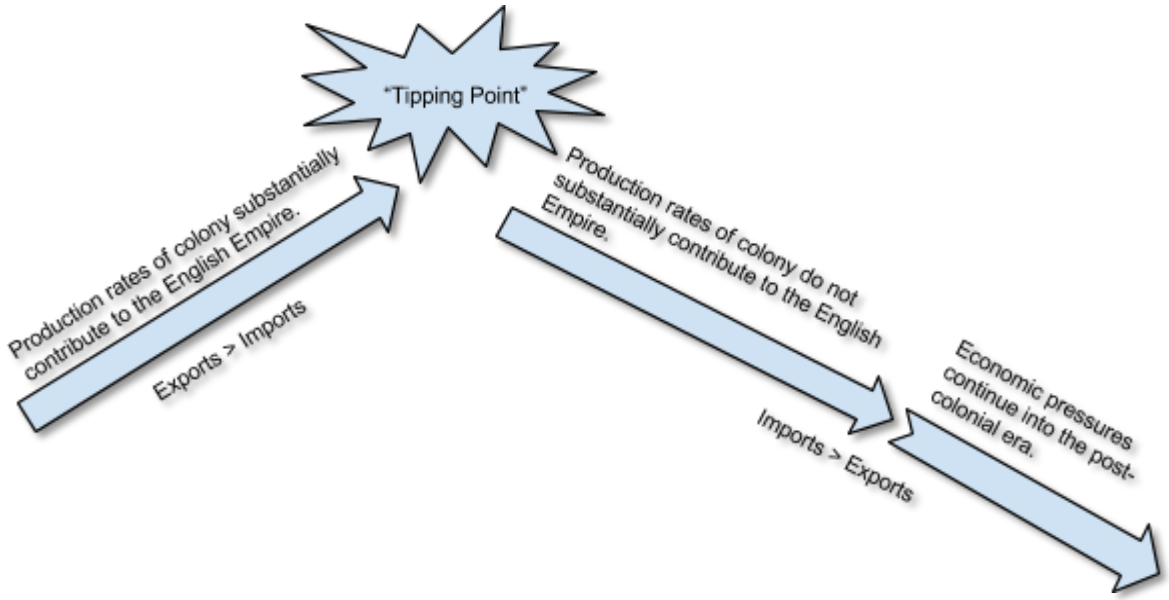

Figure 2.2 Causes and Effects of Colonial Tipping Points

Because Dominica was struggling to produce enough exports for Great Britain, a "tipping point" was reached between the colonized and the colonizer (Figure 2.2). Both the French and the English tried to make Dominic a profitable colony, but despite their efforts and considering their colonial tenacities, it was a failed investment. The island was a burden on the British Empire, because it was economically dependent. Because Dominica was severely underdeveloped, it remained under the control of the Crown until much later than other British colonies in the Caribbean and Africa. Though the island showed signs of being a weak colony early on, it was not made independent for nearly 200 years. Dominica was almost completely reliant on the British Empire, both economically and politically. Social strife made the island extremely vulnerable; therefore, it was necessary for England to continue to carry Dominica's weight in order to maintain an image of global power. After the colonial relationship was adjusted politically and economically, Dominica gained independence on November 3rd, 1976 (Encyclopedia Britannica 2013).

2.2.1 Post Colonial Nation Building with Little to Sell

Issues of nation building in the post-colonial era have certainly impacted both the social and economic constructions of culture on the island. After Dominica became independent, the economy remained export driven. According to Honychurch, "Dominica was more dependent on bananas than any other member of the Windward islands. High prices during the mid 1980s gave farmers no inclination to take up the call to diversify into other crops which appeared to have less returns" (1994: 287). Therefore, the monocrop export tradition continued into postcolonial Dominica. However, as demand and prices decreased, the island had no economic back up plan, and fell into debt to the

IMF and World Bank (Baker 1994: 287). Political and economic tensions rose, and Dominica was tempted by talk of communism and illegal drug trafficking. Internationally, "the spectre of Dominica turning into another Haiti was also increasingly being used by government ministries in the 1990s (Honychurch 1995: 288). In the postcolonial era, bananas had been Dominica's lifeblood, and transitioning away from the dependence on that specific export took decades. However, it seems that one monoresource industry (water) is replacing the previous monocrop (bananas) that drove the economy for so long.

Dominica's economy is uniquely situated in the islands culture. According to Mantz (2007: 21),

> Economic processes are morally and culturally naturalized into the ethos and everyday lives of Dominican people, as well as the historical processes through which they become embedded. Trade in Dominica is conditioned by a long history of engagement between local and global cultural and economic processes.

Currently, the social construction of water is economically impacting the development of Dominica. The island's abundance of fresh water attracted the industries interested in economic and natural resource development. However, resource exportation has been a local industry for several decades, "Since the late 1970s Dominica has been exporting water by tanker under agreements with various companies. Spring water is also bottled for export" (Honychurch 1995: 193). In fact the sale of natural resources was one of the original economic developments in the post-colonial era. Honychurch reviews these previous endeavors by stating that, "He added that [Colonel John] 'under new socialism we shall ensure that natural resources are locally owned and controlled and therefore exploited for the benefit of the nation as a whole'" (Honychurch 1995, 285). Mantz (2007) maintains that Dominicans, like other people in the Caribbean have adapted to be flexible, and

> Flexibility is an internalized cultural trait coeval with the constitution of the Caribbean as a modern creation beginning in the late fifteenth century and the concomitant capitalist expropriation that accompanied its development. Historically, flexibility inheres for Caribbean people notions of the creative, autonomous subject struggling against the adversity of colonial control (21).

Economic flexibility and natural resource sharing are deeply rooted in Dominican society. One of Mantz's (2007) informants stated

> Dominicans have these resources, and can supply the rest of the Caribbean with them. Our future is not in the resort, or in the international airport… Our future is in our ability to convert these resources into

> product that we can sell." Dominicans had always sold something, he remarked, and water, minerals or fruit juices are really no different than bananas or limes… bananas you can't sell or eat go to waste. Water you don't drink goes into the sea (28).

Although the sale of natural resources is not new to Dominican culture and economy, history has shown that extraction has not always worked to benefit the island, and, "As a study by Dominican Cecilia Green bluntly put it, 'Dominica has generally had poor luck with enclave industries'" (Honychurch 1995: 301). It is imperative to understand past economic endeavors to recognize contemporary justifications and impacts.

In 2009, Michael E. Campana wrote on his interactions with an economic developer who was interested in exporting water from Dominica in bulk to countries experiencing water shortages. He proposed to export 37 billion gallons of water each year from Dominica's rivers, and to sell it to various countries, including China, Venezuela, and the United States. This developer argued that this endeavor would aid the current global water crisis, but did not fail to mention the economic opportunity that this project would produce $3 billion in profit for the company. Campana conducted a preliminary investigation of whether or not Dominica even had enough freshwater for the supply. He calculated that the 37 billion gallons that would be annually extracted, exported, and sold equaled 16% of the island's freshwater resources. Campana concluded that he did not know what the implications of this project would have on the environment and people of Dominica.

The nation has since proceeded with this effort of economic development, and Dominica is currently exporting billions of gallons of freshwater each year in various forms, including water bottles, and on cruise ship water tanks. Many Dominican citizens perceive freshwater as being over-abundant. Currently, freshwater is a widely available resource for Dominicans. It is important to situate the amount of freshwater being exported, the proposed projects for increasing exportation, and changing water availability due to climate change.

2.3 People and Culture of Dominica

The capital of Dominica is Roseau. According to the 2014 census, Dominica has a population of 73,449. The CIA World Factbook has categorized Dominica's population into the following age groups. The percentage each group represents within the whole population is indicated below, as well as the male/female differences:

0-14 years: 22.1% (male 8,300/female 7,939)
15-24 years: 16.7% (male 6,311/female 5,946)
25-54 years: 41.5% (male 15,470/female 15,004)
55-64 years: 9.2% (male 3,604/female 3,147)
65 years and over: 10.4% (male 3,386/female 4,342) (2014 est.)

According to Mantz (2007: 28), Catholicism has greatly influenced Dominican culture, and in turn has also influence the economy and resource management. The moralities of sharing with others and utilizes all resources as completely as possible have guided the way in which Dominicans conduct their daily interactions and international transactions. Therefore, Catholic teachings, coupled with other impacts of colonization, have contributed to the perspective addressed in this study that Dominicans feel they have a moral obligation to share their abundant water resources. A majority of the population identifies as Roman Catholic (61.4%). The remaining religious affiliations of the population are as follow: Protestant 20.6% (Seventh-Day Adventist 6%, Pentecostal 5.6%, Baptist 4.1%, Methodist 3.7%, Church of God 1.2%), Jehovah's Witnesses 1.2%, other Christian 7.7%, Rastafarian 1.3%, other or unspecified 1.6%, none 6.1% (2001 census) (CIA World Factbook).

English is the official language, however, French patois is very commonly spoken. 94% percent of the Dominican population is literate, and the island is ranked 125th in the world for education. 26% of the population between the ages of 15 and 24 is unemployed (CIA World Factbook). Dominica's economy depends on agriculture, primarily banana exports. The tourism industry, however, has had increasing impact with the international rise in popularity of ecotourism. In 2013, Dominica imported $219.6 million worth of goods, while exporting $40.4 million. There is an unemployment rate of 23% (CIA World Factbook). Currently, "the government is also attempting to develop an offshore financial industry and plans to sign agreements with the private sector to develop geothermal energy resources" (CIA World Factbook), along with water exportation.

Though Dominica has struggled and continues to struggle politically and economically, the people of Dominica maintain a proud and positive culture. The majority of research about Dominica has been focused on botany, marine ecology, biology, or ornithology. There is, however, some literature that provides cultural insight. Past ethnographic studies have investigated cultural identity in Dominica. According to English (1991: 244), "cultural identity is made up of people's history, language, spirituality, geography, ecology, and traditions." Dominica's contemporary creole culture developed from generations of adaptation and assimilation of Indigenous, West African, and European populations. In her study, English (1991) asked both men and women what it means to be Dominica. Below are data she collected:

Male Responses:

- *17/210*
  What it really means to me to be a Dominican is that I am free to speak, and not know starvation because lots of fresh fruits and fresh water, and no casinos, no whorehouses, and least corruption in the place. I'm proud to be a Dominican (English 1991: 247).

- *17/213*
  To be Dominica, to me, means to have some interest in what is going on in Dominica. One must be aware of what is happening and one must be willing to make a contribution to the development of this country. To be Dominican means to have at least a small knowledge of Dominica's historical background and have an idea of what course it should take in the future (English 1991: 247).

- *18/233*
  To me being a Dominican has several advantages and disadvantages. Firstly, I have the opportunity to enjoy a simple and quiet life without fear of crime, since our crime rate is relatively low. I have the opportunity to enjoy our natural beauty all year round. By this I mean, bathing in our cool and refreshing rivers, enjoying a sunny day at the beach, and enjoying the natural beauty of Dominica, such as our green vegetation, the boiling lake and freshwater lake, sulfur springs, and lots more that only the people of Dominica can be proud of and foreigners envy. However, in spite of all that, educational opportunities are limited in this country (English 1991:247-248).

Female Responses:

- *17/009*
  To be Dominican means to be strong emotionally as well as physically. It means taking pride in myself and taking interest in my country's welfare. It means to think of the world and ways in which I can help to make it better for everybody (English 1991: 244).

- *18/026*
  Being a Dominican means firstly, being a very lucky person to have been born in such a beautiful, unspoilt island. However it also means having to work very hard to achieve your goals since individuals are encouraged to depend on themselves, and much outside help is not available. Unfortunately, it also means being forced to change one's career goals to others that may be more useful to the country at the present time. It means, finally being proud of yourself no matter who you are, what you do, or what level of society you come from. (It also means being forced to put up with people in authority who are thoroughly unfit for their positions, as a result of their lack or moral values and permissive ways (English 1991: 246).

- *18/037*
  Being Dominican evokes a strong feeling of pride. I am proud to be a citizen of this country. Thus far our country does not experience high rates of crime though this may be due to our developing stage of advancement. In Dominica, I can be whoever I want to be. I am free to express myself be it in song or otherwise. I am

> *proud of my country's natural beauty and naturally disgusted with its obvious failings (those brought about through ignorance and mismanagement). I foresee better things for my country and look forward to being a part in bringing these about* (English 1991: 246).

English (1991) concluded that men and women share similar opinions and perspectives on what it means to be Dominican. Though gender inequality continues to exist globally, Dominica is unique in its progress to decrease imbalance. Dominicans are proud, friendly, and generous people. They value nature and family. Patriotism and morality are held to high standards. Work ethic and charitably are key. Education and career progress are culturally important, as is the social, economic, and political development of the island.

Previous ethnographies have also investigated multiple Dominican economies. Michel-Rolph Trouillot (1988) explored the relationship between Dominica's small-scale agricultural culture and economy, and how it has been impacted or influenced by the global economies it has encountered through colonialism and banana exports. Trouillot took a networks theory approach to investigate how Dominica's banana industry is a mediator between the rural peasant labor force on the island and the world economy. In Dominica, rural culture and banana agriculture were inseparable. Bananas were a way of life, a means of income, and a tool for social advancement. Through the banana industry, rural families improved their quality of life and, in many cases, could afford to send their children to school in Dominica or abroad (Trouillot 1988: 199). Within Dominican culture, bananas symbolized economic prosperity. Beginning in the 1950s, Dominica made an agreement with England to exclusively export their bananas to England (Tourillot 1998: 227). Dominica's mountainous landscape prevented any success at large-scale plantation agriculture; so this guarantee allowed small family-based farmers to, "engage with the capitalist world economy in a characteristically non-capitalist manner" (Mantz 2003: 2). Trouillot's economic ethnography argued that Dominica has had a globalized culture since European contact, but that the extreme national dependence on one crop makes a seemingly prosperous economy severely vulnerable, and since Dominican culture, and banana agriculture and exportation are so closely related, Dominican epistemologies and life are also vulnerable.

Dominica's "Former Prime Minister Dame Eugenia Charles declared before leaving office in 1995, 'we should leave bananas before bananas leave us', a strong statement given the kinds of social and economic investment put into the sector since the 1950s" (Mantz 2003: 3). Previous studies suggest that for decades, Dominica was entirely dependent, economically and culturally, on monocrop exportation. With the rise in popularity of international cruise ship tourism and ecotourism, Dominica traded in their dependency on bananas for an economic reliance on travelers. More recently, Dominica returned to a monocrop, or rather a monoresource, exportation strategy. The sociocultural experience of this economic scheme is the focus of this study. Beginning in the late 2000s, bulk water exportation became a common topic of discussion both locally

in Dominica and within foreign investment communities. This new economic endeavor and formation of new business relationships recreates the former economic dependency Dominicans experienced through the banana industry. Though there is potential for national prosperity, monoresource dependency also creates the potential for economic crash, "Dependency theorist argued that capitalism in fact created conditions of underdevelopment and poverty by extracting raw materials and resources from third world nations towards the development of the capitalism (or colonial) metropolis" (Mantz 2003: 4; citing Baran 1957, Frank 1967, Frank 1969, Rodney 1972, Amin 1976, and Wallerstein 1976). Water exportation makes Dominica even more vulnerable to the scenarios that dependency theorists describe, because populations are intrinsically dependent on the resource for more than just economic development. As more than one respondent in this study claimed, *water is life*.

One facet of this study is the moral responsibility Dominicans express as a reason to export their abundance of water to places that lack the resource. Moral economies have previously been studied in Dominica. Like Tourillot before him, Mantz (2003) claims that,

> The central problem for understanding political economic change in Dominica lies not only with localizing the experience of capitalism in the cultural and historical context, but also in terms of juxtaposing these experiences against a caricatured 'neo-classical economics' that inheres self-interest as its guiding principle. *It is my fundamental theoretical assertion that 'self-interest' as a concept and its existence within Dominican (sometimes among the most 'traditional' of institution) is itself a culturally mediated experience* (12-13)

Selfishness, or self-interest, is not a common characteristic in Dominican culture like it is in traditionally capitalistic ones. Therefore, economic schemes, like water exportation, that have ties to capitalism and the global market are culturally re-interpreted by Dominicans. This study suggests that though the majority of the Dominican population believes that the main motivation for the Dominican government to enter relationships with foreign companies and export water was for economic or capitalistic progress, as individuals, the majority of participants justified water exportation through a moral responsibility they felt. It was described that Dominica has an abundance of water and many places do not have sufficient quality or quantity of water, and therefore, for them, water is not being exported out of self-interest but as a way for Dominica to aid in the world water crisis. Dominican epistemologies and historical experiences have created a complex culture. Mantz (2003) describes,

> Within the Caribbean, Dominica represents in a certain sense the cultural repository for resistance to colonial and capitalist hegemony: it has the region's only remaining indigenous Carib Indians; it boasts of a powerful

> 'peasant' laboring class tradition; it has a vibrant folk tradition; it has been a site of constant maroon and slave rebellions throughout history; it was a British possession through much of its colonial history until independence in 1978, yet the dominant language is a French and West African-based Creole language similar to that spoken in Haiti, and apart from Haiti, it is historically perhaps the most isolated of all Caribbean islands (21-22).

In Dominica, there is, and historically has been, a social contradiction between a desire for economic development or progress, and the moral majority against self-interest and capitalist authority (of central or foreign powers). Trouillot (1988) first argued that for Dominican culture, it is vital to find a way to mediate the economic actions necessary for the global social advancement that Dominicans desire and principled moral integrity they strive to uphold. Mantz (2003) further verified this cultural phenomenon. This study follows in their footsteps, and seeks to understand the cultural meaning of water and the cultural negotiation of water exportation.

2.4 Theoretical Foundations

Anthropology has an extensive history of studying the interactions between humans and their environments. Archaeology investigates the adaptations of past societies and socio-cultural anthropologists have documented relationships with the environment, like Traditional Ecological Knowledge (TEK), of living communities. Susan Crate states that, "although early climate and cultural studies were mainly founded in archaeology and environmental anthropology, with the advent of climate change, anthropology's roles have expanded to engage local and global contexts" (2011: 175). As the threats of climate change continue to increase, anthropological studies are now turning to the applied and theoretical concepts of resilience, vulnerability, risk/risk perception, and coping strategies. Climate change data has revealed that some of the most vulnerable populations are those located on Small Island Developing States (SIDS) or in coastal regions. SIDS are defined by, "land area, population, economic and environmental characteristics" (Pelling and Uitto 2002: 50). Pelling and Uitto suggest that,

> Small islands share many of the human systems and physical processes of larger or continental developing states which make them vulnerable to natural hazards: a colonial history, reliance on primary exports, extreme of poverty and inequality, limited physical and social infrastructure, inappropriate land use and weaknesses in governance and public administration. However, islands also exhibit range of intrinsic problems. The impact of globalisation on both facets of vulnerability needs to be considered (2002: 53).

These areas are not only physically vulnerable to the increasing intensity and frequency

of weather events, but generally are very socially and politically vulnerable as well. Therefore, anthropological studies on how humans relate to their changing environments are becoming more relevant and necessary.

Contemporary climate change studies are often multidisciplinary, therefore, in order to understand how the history anthropology of climate change developed, it is also important to acknowledge the various fields that have contributed theoretically and methodologically; "academic disciplines do not develop in isolation" (Milton 1997: 477). Fields like Natural Sciences, Ecology, or Climatology provide data to cultural climate studies of the current and predicted climatic changes. Geographers have provided spatial analyses of both the physical and human responses to changing climates. These fields often analyze strictly quantitative data, which tends to neglect the human experience. Social Scientists, like Anthropologists, have expanded the perspective of climate change data by introducing qualitative methodologies (Crate 2011: 176). Ultimately, this mixed methods interdisciplinary approach will more efficiently guide physical and cultural climate change studies.

Anthropology as a field has also branched off in various ways to pursue different subfields and theoretical approaches to climate change, such as Political Ecology, Ecological/Environmental Anthropology, and Applied Anthropology. Together, these fields have created the foundation for Climate Change Anthropology, both theoretically and methodologically. K. Milton claims that, "in anthropology, as in some other disciplines, the focus of how people relate to their environment is not new; anthropologists working in the area often referred to as 'ecological anthropology' have been studying this relationship for the past 100 years or so" (Milton 1997: 477). As can be seen today with a dramatic increase in climate change anthropologists, the sociocultural realities of the practitioners influence the theoretical frameworks they pursue (Milton1997: 477). Similarly, biological or ecological sciences have often influenced how culture is understood. For example, as Darwinian theory grew in popularity, social scientists attempted to apply the same concepts through environmental determinism theory, because, "if biological diversity could be explained by environmental pressures, then why not cultural diversity? (Milton 1997: 477-478). Milton argues that environmental determinism was popular in two different theoretical periods. Initially, the earliest form of environmental determinism was also referred to as "anthropogeography" (Geertz 1963:1-2), because the studies used terrain maps to explain community distributions, as well as why some so societies were more complex than others. This theoretical framework, however, was flawed, and as anthropologists like Malinowski and Boas further developed ethnographic methods, the concreteness of environmental determinism was heavily scrutinized for lacking the ability to explain social complexities, such as economic or family systems (Milton 1997: 478). Therefore, rather than arguing that the environment determined culture, a theoretical shift towards "possibilism" occurred (Milton 1997: 478).

The theoretical framework of environmental possibilism was also lacking in a

complete explanation of how humans relate to or are influenced by their environment, so the concepts of environmental determinism were revived through cultural ecology and cultural materialism (Milton 1997: 478). Anthropologists, like Julian Steward practiced this theory, and "assumed that cultural features evolve as adaptations to their local environment and that, within any one culture, there is a complex feature that is more directly influenced by environmental factors than others" (Milton 1997: 478). This framework differed from previous theories of environmental determinism because its goal was to explain for more specific cultural adaptations to specific environmental features (Milton 1997: 478). Though critics pointed out flaws in environmental determinism theory throughout its reign, it was not until the 1960s and 1970s that this theoretical explanation for human-environment interactions was truly abandoned (Milton1997: 480). K. Milton suggests that this "fall of environmental determinism" took place for two reasons: 1) "the assumption that cultural features invariably adapt to environmental conditions had been seriously undermined by empirical observations," and 2) "a revolution in social and cultural anthropology (and to a lesser extent in the other social sciences) against causal explanation" (1997: 480). These two factors significantly changed the foundation of the anthropological understanding of how humans interact with environments.

Milton's discussion of this intellectual revolution marks an important point in the historical context of climate change anthropology, because the types of questions researchers were asking were reframed, and therefore, the way they understood how humans perceive their environments changed as well. As explained by Milton,

> Analysis in social science, and presumably in the other sciences, consists primarily of placing things in context in order to understand them. It is the assumptions made by the analyst that identify the appropriate context. When human activities are assumed to be caused by environmental factors, the environment is clearly the context in which they need to be understood. However, when teleological assumptions (that human activities are performed in order to achieve specified goals) replace causal ones, the relevant context shifts. Human activities need to be understood in terms of their goals and the knowledge needed to perform them ('knowledge' is used here in a broad sense to refer to assumptions, beliefs, values, norms, etc.). These things exist, not in the external environment, but in the minds of the people whose activities are being studied. Until this shift in theory, anthropologists had not found it particularly important to distinguish what people do from what they hold in their minds, but the new interest in understanding why people act as they do made such a distinction necessary (1997: 481).

As a response to this intellectual and theoretical recontextualization, Milton suggests a schism formed within socio-environmental studies. One direction that was taken was the framework of ethnology, which pursued a more social sciences approach than

ontological studies of how humans perceive their world. In contrast, a separate branch towards a more biological understanding of humans and ecosystems developed (Milton 1997: 481). Both of these theoretical approaches addressed how humans interact with their environments. However, the research questions and methodologies differed.

The more ontological branch to ethnoecology or 'cognitive anthropology' as was termed by Tyler in 1969 and includes the sub-interests of "'ethnobiology', 'ethnomedicine', 'ethnobotany' and 'ethnoecology'" (Milton1997: 484). The naming of this theoretical approach to human-environment interactions is significant in defining the intellectual boundaries of the practitioners,

> The prefix 'ethno-' denotes a field of knowledge defined from the viewpoint of the people being studied rather than the analyst, and is similar in meaning to the term 'folk' (as in 'folk knowledge', 'folk medicine', etc.)(Milton 1997: 484).

Traditional or 'folk' knowledge about plant-based medicine or resource management, like Traditional Ecological Knowledge (TEK), is time tested and provides just as good, if not better, environmentally sustainable solutions to environmental problems. Therefore, ethnoecology or TEK, in my own opinion, is a very important anthropological topic of study, because it provides multifaceted successful understanding, meanings, and uses for natural resources and environmental landscapes.

Milton then argues, "Thus anthropologists who followed this route were more interested in what generates human activities (goals, motivations, assumptions, beliefs), and in the social and cultural consequences of actions, than in their ecological impacts" (1997: 484). In contrast, a more appropriate analysis of that field suggests that any contemporary' ethno-' study provides a more accurate understanding of the environment and resources based on the temporal span of TEK development.

Both of these approaches use primarily qualitative research methods, however, ethnography often uses numbers and ethnology is the comparison of multiple similar cultural traditions and is heavily numeric. In general, the ontological approach was fundamentally a social science, where the ecosystem theory drew from biological sciences. Milton suggests that,

> The ecosystem approach was a departure from the traditional methods of social and cultural anthropology. In focusing on the material consequences of human activities, it marginalized people's understandings of the world, and took ecological anthropology out of the realm of social science and into the sphere of scientific ecology (1997: 483).

In contrast, Rappaport argues the importance of ecosystem studies stems from their ability to address, "the total living and non-living substances bound together in material

exchanges within some demarcated portion of the biosphere" (1971: 238). Though this theory is derived from biology, it differs from the previous conceptions of environmental determinism because it acknowledges a relationship of exchange, rather than a one-sided understanding of humans only being influenced by their environment, and not the other way around, "thus it is the combined understanding of the material impact of human populations on their environments (and vice versa), and of how people think and why they act as they do, that is seen as the proper goal of ecological anthropology. "(1971: 484) Therefore, "it is argued that this combination of insights into the material and the cultural provides both a richer understanding of human ecology, and an appropriate basis for planning a sustainable future" (Milton 1997: 484).

In conjunction with these theoretical developments in the 1960's and 1970's, the subfield of applied anthropology was developing both theoretically and in practice. In the past and present, applied anthropologists often address environmental and climatic issues for communities. Their regions of study are often in the most rural or vulnerable locations, so their contributions to anthropology have been significant in shaping climate change studies, and are particularly relevant for SIDS. This field has contributed to the larger umbrella of climate change anthropology by developing and testing methodologies for understanding and mitigating vulnerabilities.

In the 1990's, another theoretical shift took place in the arena of cultural climate studies. Like the previous revolution against environmental determinism, this theoretical reformation resulted from critiques of cultural relativism and modernist theory (Milton 1997: 485). Milton provides the two foundations of cultural relativism as, 1) "that a culture cannot be properly understood in terms of ideas imported from another culture," and 2) that "cultural relativism has been taken to mean that all cultures are equally valid interpretations of reality, that they are equally true" (1997: 485). From these two concepts, anthropologists rejected cultural relativism based on the limitations that the separation of cultures creates. For example, if cultures cannot be understood through outside frameworks, anthropologists can neither pursue cross-cultural comparisons, nor questions regarding globalization. Similarly, theoretical understandings of social constructionism came into questions, because if a culture is completely independent, how it was constructed, "the constructivist doctrine recognizes no mechanism through which the external environment can enter people's knowledge" (Milton 1997: 486). Therefore, radical approaches to cultural relativism were highly criticized, just as radical approaches to environmental determinism were, because they left out any opportunity for alternative influences or human adaptations to outside interaction with either other groups or the environment. A second criticism of cultural relativism in the 1990's was the application of essentializing or universalizing theories that drew distinctions between the human mind and body, or between human culture and the environment (Milton 1997: 487). This critique is a recycled argument. So far, the history of climate change anthropology has swung like a pendulum from the environmental extreme to the social extreme and back again. Crate argues, "In the past two decades anthropology's focus on climate and culture has evolved to include the dynamics of unprecedented

contemporary climate change" (2011: 178). Climate change, therefore, is both providing and requiring a new perspective on how humans interact with their environments, as well as how these influences and adaptations are changing to find a balance.

2.4.1 Climate Change Anthropology

Noticeable increases in climate change have created yet another theoretical shift that is drawing from a strong interdisciplinary framework. Previously, there seemed to be limitations on anthropologists making them focus either on the human perspectives or physical features of human-environment interactions. Now, mixed methods and multi-field theoretical framework are creating a more complete picture of culture and climate. Crate explains that,

> To date much is known about the physical changes, ongoing and projected, resulting from contemporary climate change. Natural scientists have generated more than sufficient proof to show the world that (*a*) contemporary global climate change is happening; (*b*) it is unprecedented in comparison to the natural climate change cycles of the past 600,000 years (time period based on ice core records of Antarctica); and (*c*) it is, to a significant degree, a result of human activity (2011: 178).

This scientific data is fundamental for climate anthropology, because it validates that, "global climate change has cultural implications" (Crate 2011: 178). This reorganization of studying culture and climate has not only incorporated outside fields, but also different anthropological approaches. Therefore, the anthropology of climate change if of course part of environmental anthropology, but it is also part of the anthropology of communication, of translation, of prophecy, of trust, of expertise, of blame, of historical narrative of ideology, of religion, of homeland" (Rudiak-Gould 2011: 12).

Susan Crate suggests that the theoretical framework of, "contemporary climate change studies, [has] divided into two areas: (*a*) place-based community research and (*b*) global negotiations and discourses" (2011: 179). Place-based community research is geared towards local perceptions and responses to environmental changes that are a result of climate change. These responses are either understood as coping-strategies or adaptations. To understand the local experience of global climate change, place-based analyses incorporate the theoretical frameworks of vulnerability and resilience (Crate 2011: 180). These concepts incorporated interdisciplinary approaches, because vulnerability can be environmental, economic, social, or political. Susan Crate claims that,

> An important insight from these studies is how communities' adaptation to climate variation and change is not a simple function of technical solutions. On the contrary, human adaptation more often is determined by sociocultural relationships manifest in a web of reciprocities, obligations,

> and assets, including social capital—an asset important for access to resources in times of stress (2011: 180).

Climate change anthropology, therefore, frequently applies Political Ecology theory (Figure 2.3) to understand the increasing complexities of human-environment interactions, and "as the name of this approach implies it is a synthesis of political-economy and human ecology approaches to nature-society relationships" (Pelling and Uitto 2002: 50). This theoretical framework remains to be a foundation of contemporary climate change anthropology.

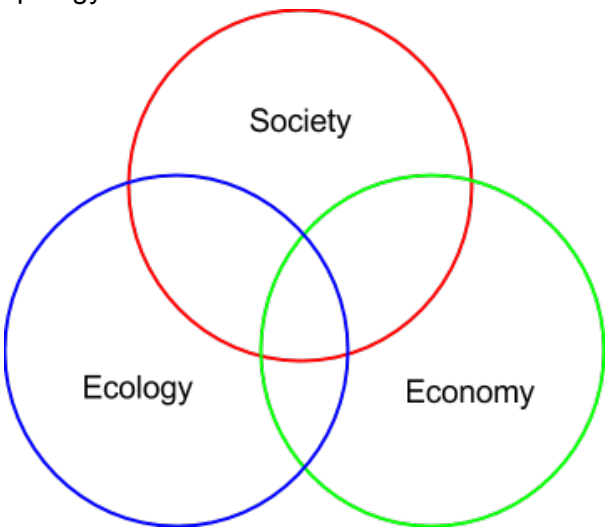

Figure 2.3 Climate Change Anthropology

Anthropologists studying climate change often incorporate theoretical frameworks from Geography, like disaster and hazard studies, "disaster and displacement research within the climate change context shows how traditional emergency preparedness systems need to be adapted to accommodate the new challenges" (Crate 2011: 181). Similarly, anthropologists borrow elements from Natural Resource Management to understand how global climate change will impact communities from either an increase or decrease in resources, such as water (Crate 2011: 181). Crate explains that, "Anthropologists are investigating a spectrum of issues related to too much water in the form of rising sea levels due to climate change, including displacement, adaptation, vulnerability, and the politics of development (2011: 181). These investigations are particularly important in the highly vulnerable regions of Small Island Developing States (SIDS).

As place-based analyses of global climate change were increasingly validated, they begin to contribute to the second branch of contemporary climate change studies. Global negotiations regarding the impacts of climate change are significant topics of discussion for anthropologists, because,

> Climate change is a human rights and a human security issue. To these ends, anthropological initiatives often work to empower local populations,

> regions, and nation-states to seek redress. Climate justice, a reframing of environmental justice in the face of climate change, is one important focus for anthropologists, particularly those already working in the field of human rights and largely spurred by studies of displacement, migration, and forced relocation of affected communities (Crate 2011: 182).

It is through this branch of contemporary climate change studies that sustainability theory is incorporated into the anthropology of climate change discourse. Here, data on clean energy and consumption rates would not only be incorporated, but the resource management data collected in place-based studies would be applied as well to contextualize the future for humans and their environments (Crate 2011: 183). Since studies have shown an increase in the impacts of climate change, predictions and precautions are necessary. Cultural climate studies are no longer merely observations of human-environment interactions, but have now shifted towards more intervention-like theoretical frameworks, and according to Crate, "anthropologists have much to be congratulated for in terms of their contributions to local to global understandings of how climate change is affecting our worlds" (2011: 183). That being said, theories on climate change and sustainability have yet to be validated completely, so there is a need for further research.

2.5 Water Sales and Small Island Developing States

Bottled water as a commodity is a strange and destructive modern phenomenon. Richard Wilk writes on how water bottle industries have introduced cultural values into their branding to increase sales (2006: 303). Wilk explains,

> "Rich countries like the USA import substantial amounts of water from poorer places like Mexico and India, countries hardly known for their high standards of water purity. Some countries have even specialized in water export; for example the Pacific island nation of Fiji, which has capitalized on its image as a 'virgin ecosystem' far from polluting civilization, now sells over US$90 million worth of water a year" (2006: 306).

The argument Wilk presents on Fiji water can be applied to the branding of exported Dominica water as exotic blue clear natural water from a Caribbean island. This interpretation of the resource could drive sales and increase the profit margin, as well as significantly degrade the environment. Wilk "concludes that bottled water is a case where sound cultural logic leads to environmentally destructive behavior" (Wilk 2006:303).

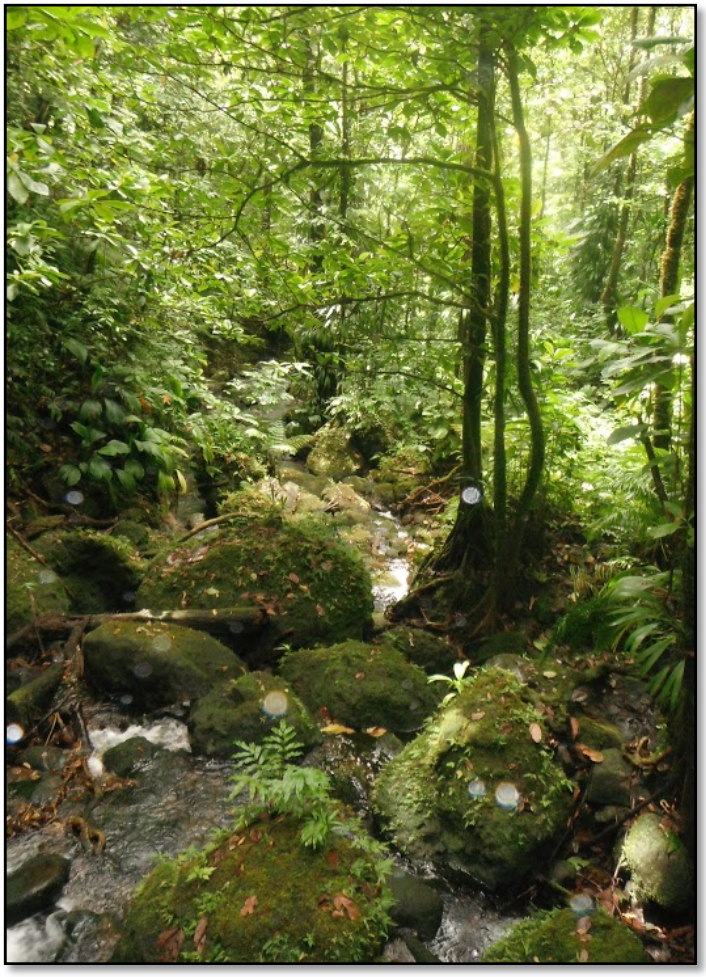

Figure 2.4 Spanny Falls Stream

Wilk explains that origin (i.e. islands, springs, and mountains), nature, and purity are always characteristics associated with successful bottled waters. Dense forests and countless streams and rivers blanket mountains of Dominica (Figure 2.4). Dominica has already branded itself as *Nature Island* or *The Land of 365 Rivers* as a form of patriotism and to promote tourism. These qualities are easily appropriated by water bottling companies in the branding and marketing processes. Unfortunately, in other large-scale water extraction projects, like Fiji, water is transported in large bulk tanker or bladder ships rather than being bottled in country and transported later. This process decreases the amount of potential jobs for the people living on the island that is exporting the water, which is one of the key ways a place like Dominica could benefit from the endeavor.

Freshwater is very precious. For islands, the resource holds an even higher value. Currently, Dominica is unique in that freshwater springs, streams, and rivers flow abundantly. In contrast, many other islands or SIDS struggle with sustainable water management. Bates et al. summarize the significance of water on islands, physically and economically.

> Water is a multi-sectoral resource that links to all facets of life and livelihood, including security. Reliability of water supply is viewed as a critical problem on many islands at present and one whose urgency will increase in the future. There is strong evidence that, under most climate change scenarios, water resources in small islands are likely to be seriously compromised (very high confidence). Most small islands have a limited water supply, and water resources in these islands are especially vulnerable to future changes and distribution of rainfall. The range of adaptive measures considered, and the priorities assigned, are closely linked to each country's key socio-economic sectors, its key environmental concerns, and areas most at risk of climate change impacts such as sea-level rise (2008:109).

This general statement about the status of freshwater on islands indirectly highlights how unusual it is for Dominica to export the resources, particularly on such a large scale.

2.6 Small Island Vulnerability to Climate Change

Heather Lazrus provides four important theoretical definitions for understanding why Small Island Developing States (SIDS) are important regions of study for climate change anthropologists:

1. Vulnerability: susceptibility of people to damage or harm from exposure to stresses and the inability to adapt to the change.

2. Resilience: ability to absorb or recover from exposure to stresses.

3. Adaptation and adaptive capacity: anticipatory, reactive, spontaneous, or planned changes people make to reduce potential harm and their capacity to do so.

4. Agency: capacity of individuals and groups to act freely in ways that may be culturally informed (2012: 286).

These definitions are significant because they are theoretical frameworks as well as tools of measure. Anthropologists conduct studies to better understand these four concepts, as well as coping strategies, and understanding the experiences and impacts of global climate change on local or SIDS communities. The relationship between climate change and island communities is unique. These data revealed that SIDS vulnerabilities to climate change are based on sea level rise, increased precipitation, storm patterns, and increased temperatures. Anthropology is an appropriate field to enter the multidisciplinary approach for studying the impacts of climate change on island communities, because the theoretical frameworks previously mentioned provide an insight on understanding the social impacts of global climate change, particularly in

extremely vulnerable regions. Another is to address local risk perception. Similarly, anthropological frameworks can investigate the relationship(s) between adaptation and resilience, or migration and resettlement. Anthropology looks at these complex associations between humans and the environment; justice, equity, and power further complicate the relationships,

> In this understanding, human vulnerability is a product of physical exposure to natural hazard, and human capacity to prepare for or mitigate and to recover from (cope with) and negative impacts of disaster. Thus vulnerability is a product of access to economic, political, social, environmental, and geographical assets (Pelling and Uitto 2002: 51).

Island communities are appropriate study areas, "because of their place in global imaginations, because they stand to be immediately and heavily affected by climate change, and because they complicate easy notions of scale that can obfuscate particular places and people" (Lazrus 2012: 287). The history of most SIDS, like this Caribbean example, have created a context of chronic vulnerability. Colonization and cash crop industries have restructured the social and physical landscapes of SIDS,

> The local consequences were deforestation, loss of indigenous populations, local food insecurity and extremes of socioeconomic and political inequality. This was-- and to a large extent still is-- reflected in economic dependency and human vulnerability (Pelling and Uitto 2002: 54).

SIDS are uniquely economically vulnerable due to their, "small size, insularity, remoteness and proneness to natural disasters (Briguglio 1995: 1615). Briguglio expands on these economic vulnerability factors (1995: 1617-1617):

- Small Size
    - Limited natural resource endowments and high import content
    - Limitations on import-substitution possibilities
    - Small domestic market and dependence on export markets
    - Dependence on a narrow range of products
    - Limited ability to influence domestic prices
    - Limited ability to exploit economies of scale
    - Limitations on domestic competition
    - Problems of public administration

- Insularity and Remoteness
    - High per-unit transport
    - Uncertainty of supply
    - Large stocks

- Proneness to Natural Disasters

- Environmental Factors
    - Pressures arising from economic development
    - Environmental characteristics of SIDS

- Other Characteristics of SIDS
    - Dependence on foreign sources of finance
    - Demographic factors

These economic vulnerabilities also have social and political implications for SIDS.

One way SIDS are vulnerable to the environmental experiences of climate change is because, “change in timing and amount of rain will affect freshwater resources” (Lazrus 2012: 288). Similarly, SIDS are extremely vulnerable to sea-level rise, as a result of climate change. James Lewis delineates the potential ways in which islands will be impacted by rising sea levels (2012: 243);

- Reduced island size (due to sea encroachment and coastal erosion) leading to reduced shore length and changed shoreline;

- Decreased groundwater (lens) capacity (concomitant with reduced landform area);

- Increased exposure of freshwater and vegetation to salinization (due to wind borne salt and sea water in porous ground);

- Reduced food production (less land area and increased salination);

- Increased incidence and penetration of tropical cyclones and sea-surges;

- More extensive and longer lasting food shortages;

- Increased risk of malnutrition, environmental health hazards, epidemics (e.g. cholera, typhoid and schistosomiasis);

- Movement of human settlements from coastlines (where possible);

- In-country migration from low to high islands (with consequent increases in the population density of high islands);

- In-country migration to urban centres (for the achievement of apparent security);

- Emigration between countries from low islands to higher land;

- Increased demand for emigration to continental countries and consequent "ecological refugees" (Tickell).

Caribbean SIDS seem to be, in some ways, more resilient than other SIDS, because many Caribbean people have migrated away from their birthplaces. In this sense, migration increases economic resilience because family members living abroad send remittances home to support their relatives. However, Pelling and Uitto recognize that the most vulnerable of populations probably lack access to international mobility, and therefore, "inequality in resilience born out of inequality in wealth is therefore unlikely to be leveled" (2002: 56).

SIDS are not only physically vulnerable to more intense and frequent tropical storms and weather events that will impact the natural resources, but Lazrus explains how other vulnerabilities are created by the manner in which island communities are connected to and perceived by the rest of the world. This relationship has social, political, and economic implications above and beyond the physical effects of climate change (2012: 295).

Anthropology research studies these effects that are not recorded by climatology data. One way of doing this is to study the Traditional Ecological Knowledge (TEK) of island communities,

> Agency in the form of adaptive capacity and resilience harnesses local ways of knowing and traditional practices, responds to culturally specific ways of perceiving risk and assessing vulnerability, and accesses local and regional networks that support regional organizations representing islanders' international forums as wells as current forms of migration (Lazrus 2012: 295-296).

However, studies in the Pacific and Indian Oceans have shown that TEK, traditional economies, and traditional coping strategies to environmental shifts have been threatened by modernization. It can be assumed that these findings also relate to the Caribbean, since it is, "the most urbanized island region" (Pelling and Uitto 2002: 58). Urbanization creates advantages as well as disadvantages to SIDS. Often, aid organizations are clustered in urban settings, but in contrast the, "rapid and unplanned nature of urban explosion in the Caribbean and Pacific islands means that growing numbers of residents are denied access to urban services and basic needs and exposed to industrial hazards" (Pelling and Uitto 2002: 58).

2.7 Dominican Water Vulnerability

Within the Caribbean there are a series of contemporary nation states that are vulnerable to a wide range of natural, social, cultural, and economic impacts. Political and economic vulnerabilities have affected the Caribbean for hundreds of years, but

more recently, environmental vulnerabilities have increased the level of risk these islands face. Bates et al. claim, “It has long been known that the problems of small scale and isolation, of specialized economies, and of the opposing forces of globalization and localization, may mean that current development in small islands becomes unsustainable in the long term” (2008: 111). As previously discussed, small islands are vulnerable to climate change. The Caribbean, however, is particularly vulnerable in terms of access and availability of quality freshwater.

> In the Caribbean, many islands are expected to experience increased water stress as a result of climate change, with all SRES [Special Report on Emissions Scenarios] scenarios projecting reduced rainfall in summer across the region. It is unlikely that demand would be met during low rainfall periods. Increased rainfall in the Northern Hemisphere winter is unlikely to compensate, due to a combination of lack of storage and high runoff during storms (Bates et al. 2008: 110).

Although Dominica currently has an abundance of water, it is not exempt from this projection of water stress. According to the World Resources Institute, Dominica, along with surrounding islands, is considered as having high risk or extremely high risk for various indicators of water quality and quantity (Figure 2.5).

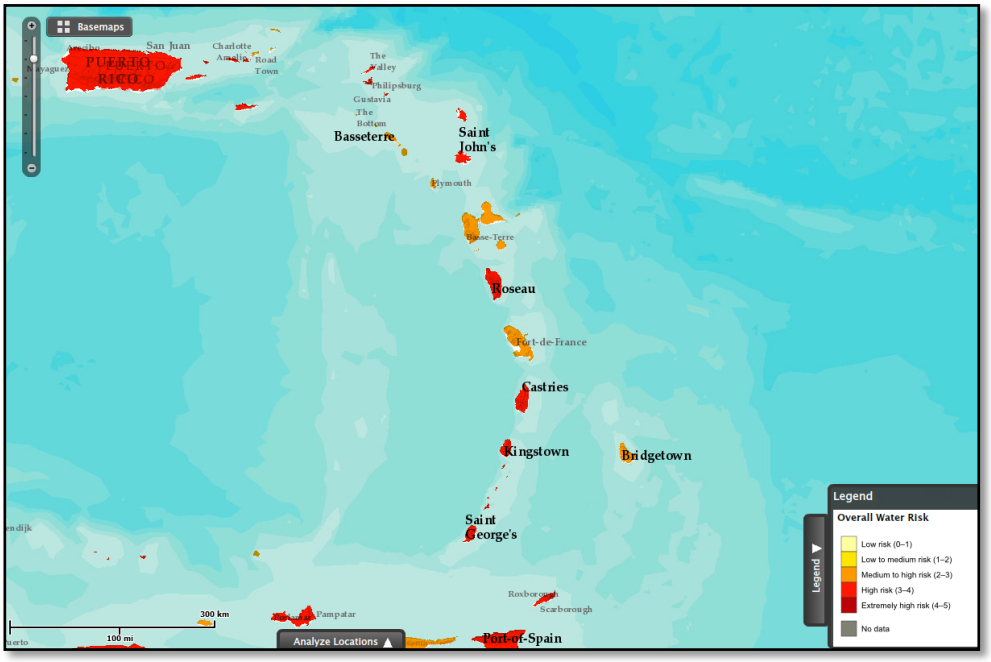

Figure 2.5 World Resources Institute Aqueduct Water Risk Atlas

Category	Overall Water Risk	Physical Risk QUANTITY	Baseline Water Stress	Flood Occurance	Physical Risk QUALITY	Return Flow Ratio	Regulatory and Reputational Risk	Media Coverage
Definition	Overall water risk identifies areas with higher exposure to water-related risk and is an aggragated measure of all selected indicators from the Physical Quantity,, Quality, and Regulatory and Reputational Risk.	Physical risks related to quantity identify areas of concern regarding water quanitity (e.g. droughts or floods) that may impact short or long term water availability.	Baseline water stress measures total annual waterwithdrawals expressed as a percent of the total annual available flow.	Flood occurance is a count of the number of floods recorded from 1985-2011.	Physical risks related to quality identfy areas of concern regarding water quality that may impact short or long term water availability.	Return flow ration measure the percentage of available water that has been previously used and discharged upstream as watsewater; high values indicate higher dependecny on treatment plants and potentially worse water quality in areas that lack sufficient treatment infrastructure.	Regulatory and reputational risks identify areas of concern regarding uncertainty in regulatory change, as well as conflicts with the public regarding water issues.	Media coverage measures the percentage of population without access to improved drinking water sources; higher values indicate areas wshere people have less access to safe drinking water supplies, and consquently high repuationsal risks to those not using water in an qeuitable way.
Risk	High Risk	High Risk	Extremely High Risk	High	Extremely High Risk	Extremely High Risk	Extremely High Risk	Extremely High

Figure 2.5 World Resources Institute Water Risk Indicators

The Small Island Developing States (SIDS) of the Caribbean are particularly susceptible to climate change. Increased temperatures, sea level rise, and increased frequency and severity of tropical storms will all impact the quality and quantity of water resources.

In Dominica, water is extracted at the source. According to the Chief Engineer at DOWASCO, the water extraction process begins at Freshwater Lake in Morne Trois Pitons National Park and is pumped down to Roseau passing through several hydroelectric stations along the way. The water drawn from Freshwater Lake goes to a holding tank, which is the starting point of DOWASCO's bulk water distribution system. DOWASCO is responsible for the management and allocation of water resources on the island. Currently, DOWASCO not only provides water to cruise ships and works with foreign companies to create bulk water extraction agreements, but also distributes water to 95% of Dominican homes. A decrease in water levels would impact human settlements because DOWASCO would be obligated to uphold the lease agreement with foreign corporations. Because water is taken upstream from any settlement, village, or town, Dominicans could find is difficult to access water if too much water was extracted or the environment experienced significant drought or climate change. Most of the Dominican people interviewed in this study have experienced the island's weather becoming increasingly unpredictable, and climate change data indicates that Dominica is at high risk for dramatic changes in water quality and quantity.

From an economic standpoint, many of the people in Dominica that support bulk water exportation share the perspective that the water that is wasted or not captured

runs into the sea and is therefore lost revenue. This may be true, however, freshwater is integral in Dominica's ecology. The island is volcanic and many streams are highly sulfuric. Freshwater run off is important because it dilutes the naturally occurring element. One interviewee mentioned his experience with increased sulfur content affecting the health of the environment. Streams, marine life, and the coral reef are negatively impacted by the imbalance.

This study documents with formal and informal interviews the current perceptions of water availability and how Dominicans utilize this natural resource. In general, respondents experience an abundance of water on the island and see no potential for future drought. A complete analysis of the findings is provided in Chapter Four. There are contradictory perceptions regarding water availability in what many believe to be a rapidly changing climate and environment. These discussions (at times formal debates) are framing a national discussion regarding the physical and cultural sustainability of Dominica.

2.8 Dominican Water Exportation

The process of exporting bulk water from Dominica is moving very quickly. In less than one month, DOWASCO transitioned from water projects to improve the water quality and availability for local communities to preparing to export freshwater for profit.

- March 5th, 2010
  - Ground-breaking ceremony for Delices water project on Tuesday

- March 24th, 2010
  - DOWASCO preparing for water export business

Progress towards large-scale water exportation did not halt in March 2010. Below are a series of headlines from articles on Dominica News Online that track the progress of water exportation in Dominica (Table 2.1).

Table 2.1 Dominica News Online Article Headlines Related to Water Exportation

Date	Dominica News Online Headlines
March 5, 2010	Ground-breaking ceremony for Delices water project on Tuesday
March 9, 2010	No water shipped to St. Lucia yet, discussions ongoing- DOWASCO manager
March 11, 2010	Expected improvements to water systems island-wide estimated at $191M
March 22, 2010	Dominica exceeds international standards for drinking water- - minister
March 24, 2010	DOWASCO preparing for water export business

March 29, 2010	Barbados former PM advises Dominica to export water
April 22, 2010	Majority of DNO (Dominica News Online) Agree for Dominica to export water.
April 23, 2010	Dominica should sell its water to other countries
December 2, 2011	Dominica faces challenges in exporting bulk water
April 11, 2011	Skerrit (Roosevelt Skerrit is the Prime Minister of Dominica): Dominica well poised to export water to the international community.
January 28, 2013	Nature's Water gets new ownership, product to be enhanced
April 8, 2013	Austrie throws out challenge on water exportation

According to this news source, Dominicans and the Dominican government have consistently supported bulk water exportation. In December 2011, an article on Dominica News Online raised some issues that were surfacing from the exportation of islands freshwater resources. This article neglected any environmental impacts of this endeavor, and focused solely on issues regarding the transportation of the commodity for sales.

It is difficult to calculate the exact amount of water being extracted annually, because there are several different methods in place. Currently, any cruise ship that docks in Roseau is given permission to refill their water tanks without charge. The water is pumped from a tap managed by Dominica Water and Sewage Company (DOWASCO), like the majority of plumbed water in Dominica. Cruise ships vary in size, but the water tanks can hold up to 250,000 gallons of water. In 2011, 198 cruise ships visit Dominica (Dominica News Online: July 24, 2012). Therefore, water extracted by cruise ships alone could be as much as 49.5 million gallons each year. Water is also exported in bulk via tanker ships or as bottled water, but again, exact numbers are difficult to identify. As was previously mentioned, one bulk extraction project was initiated in 2007 when InvestDominica Authority proposed exporting 16% Dominica's freshwater resources in bulk (37 billion gallons annually). Similarly, DOWASCO has built a relationship with Sisserou Water Inc. A license has been granted to the company to export 3 billion gallons per year from the Sisserou River in the northern part of the island. To date, this endeavor has not broken any ground due to infrastructure related difficulties (Savarin: 2009).

In 2011, Reginald Austrie, the Minister for Water Resource Management in Dominica, claimed that the greatest challenge facing the island was that they have not been able to find a big enough ship to transport water efficiently (Dominica News Online). Austrie continues to push this message, and in 2013 stated, "We keep saying that a large section of the world is now suffering from lack of water and so there is a need to export our water but we have to find the investments and work out the logistics" (Dominica News Online). Interestingly, although the message of Dominica's moral responsibility it prominent in the media and in the interviews, the majority of the documentation of water exportation is related to tourism and foreign exchange. The

water given to cruise ships is a government run program. The Ministry for Water Resource Management and DOWASCO manage the current efforts of bulk water extraction as licenses and lease agreements. However, both the government and private citizens of Dominica share water regionally in times of drought. During natural disasters, the government sends bulk water and Dominicans send bottled water as aid.

Chapter Three- Methodology

Figure 3.1 Hibiscus Falls, Dominica

3.1 Introduction

The purpose of this chapter is to outline the process by which this study developed through research design, data collection, management, and analysis. There were one and a half years of background research and preparation before any formal data was collected. The fieldwork portions of this research were conducted on the island of Dominica. In June 2013, a scoping visit familiarized the area and culture, as well as tested the logistics of the study. The scoping trip provided a foundation for this study through informal social interactions with citizens of Dominica and personnel of the Dominican water management corporation. Geographical scoping also influenced community selection for the data collection that took place a year later.

During June 2014, a second trip was made to Dominica for the purpose of interviewing citizens on water resources. Though previous contacts had been made, official recruitment of respondents did not take place until arrival in Dominica in 2014 after Institutional Review Boards (IRB) approval. Respondents for this study were recruited based on their recommendation from previous interviewees, interest in participation, and knowledge about the research objectives. The recruitment of study respondents was initiated using a convenience method, and then transitioned into a snowball sampling technique. Because the sample population was not random, a stratified sample was designed in advance to achieve a composed range of responses.

3.2-Ethnographic Background

Dominica has a creole culture, as was discussed in the literature review. The island became independent relatively recently. Post-colonial nations are forced to renegotiate social, economic, and political relationships. Similarly, newly independent countries often seek economic competitiveness. For Dominica, imports dramatically outweigh exports, and the nation has explored ways to stabilize its economy. This study investigates one method they have accepted, bulk water exportation. Insight and understanding of Dominican history and culture was considered in the design of this study.

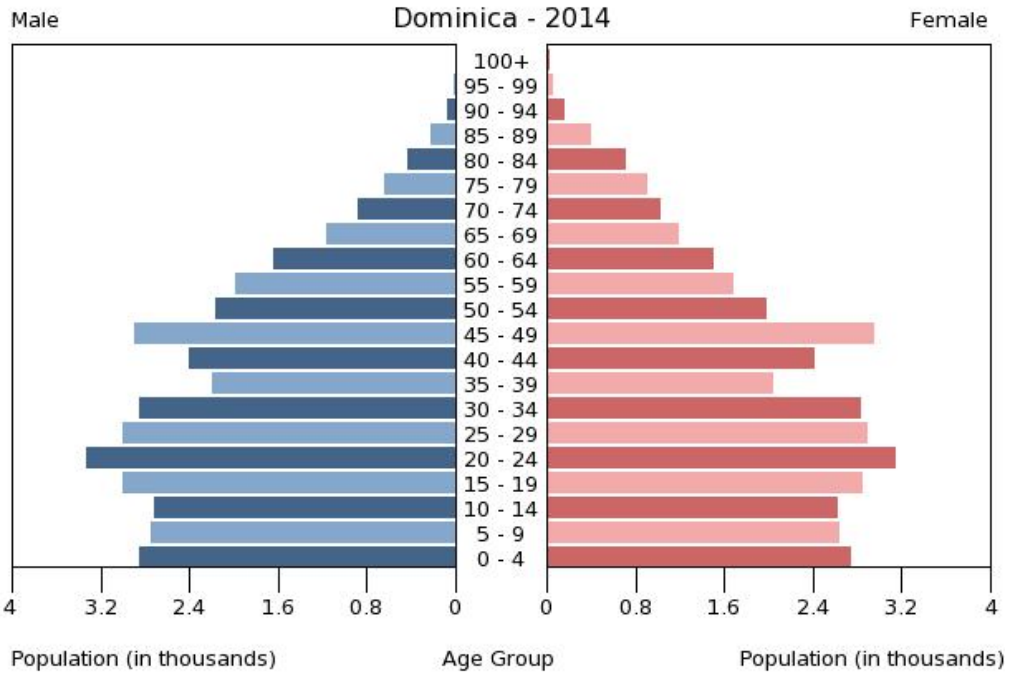

Figure 3.2 Dominican Population Pyramid (CIA World Factbook)

Dominica has experienced rapid population growth (Figure 3.2). The population pyramid above depicts how the older generations of the Dominican population produced new larger cohorts. Dominica has a potential for a further increase in population size based on the base cohort percentages. The percentages on men and women in Dominica are fairly equal, as was described in the literature review. This population pyramid not only indicates the significance of this study and the need to understand the cultural meaning of a nonrenewable resource based on population patterns, but also provides insight as to how the population should be sampled for.

Historically, Dominica had a rural agriculture-based society. Currently, over half of the populations live in urbanized communities, and this number is increasing annually. As was discussed in the literature review, during the majority of the colonial era, Dominica's economy was supplemented by Great Britain. After Independence, Dominica strengthened its economy, and place in the global market, through banana exportation. Though impermanent, the prosperity of Dominica's banana industry improved the quality of life, infrastructure, and education on the island. In the post-banana era, Dominica has sought alternative economic strategies to regain fiscal stability. Dominican culture, as was described in more detail in the literature review, has a deep connection to morality and distribution resources. Historical social and economic oppression, and dependence have created a culture where self-interest is shamed and generosity is praised. Though this cultural trait is described as Dominican, it was deemed important to interview different groups within Dominican culture to gain a more complete understanding of the cultural meaning of water and social motivations for exportation. In this study, the sample population was stratified by age, community residency (rural or urban), and gender. These basic characteristics can have an impact on a person's cultural perspectives or social experiences, and were purposely influenced the stratified sample design. The sample design will be further discussed in Section 3.4 of this chapter. The additional sections below describe the applied research methodologies in depth. This study is designed to understand bulk water exportation, and potential social impacts.

3.3-Design

This qualitative research study was designed to investigate the social construction of water in Dominica, and how the cultural meanings of the resources relate to contemporary water exportation. A data collection instrument was used to address issues regarding the cultural meaning of water in Dominica. The interviews were guided by a schedule of questions, but allowed for open-ended responses. The following seven ethnographic research themes were the focus of the semi-directed interviews.

Key topics in this instrument are as follows:

- Water Usage
- Perceived Water Availability
- Water Ownership
- Water Sales
- Common Knowledge of Exportation and Lease Agreements
- Environmental Predictability
- Environmental Change

3.3.1 Goals of the Study

A primary goal of this study was to gain an understanding of how Dominican citizens think about and use water resources through literature reviews and interviews. However, a secondary goal of this study was to gain a better understanding of the research process. Through this iterative independent research, I have become more familiar with the steps involved in conducting qualitative ethnographic research. These two goals actually share fairly similar qualities. Flick (2009) writes,

> Knowledge is constructed in processes of social exchange; it is based on the role of language in such relationships; and, above all, it has social functions. The eventualities of the social processes involved have an influence on what will survive as a valid and useful explanation. Research acts are also part of the social construction of what we can address and find in social research. And the acts of writing contribute to this social construction of worlds under study.

In order to understand the social construction of water in Dominica, I needed to first understand how to construct an anthropological study.

3.3.2 Theoretical Framework

This study was developed from a synthesis of several theoretical foundations. First and foremost, this is an anthropological study designed to conform to the conceptual frameworks of Applied Anthropology. However, Anthropology as a field has also branched off in various ways to pursue different subfields and theoretical approaches to climate change, such as Political Ecology, Ecological/Environmental Anthropology, and Applied Anthropology. Together, these fields have created the foundation for Climate Change Anthropology, both theoretically and methodologically. As the threats of climate change continue to increase, anthropological studies are now turning to the applied and theoretical concepts of resilience, vulnerability, risk/risk perception, and coping strategies. Climate change

data has revealed that some of the most vulnerable populations are those located on Small Island Developing States (SIDS) or in coastal regions. Therefore, many intellectual facets within anthropological theory and application have influenced this research design. This research does not aim to promote a specific theory as an answer to the research questions. Instead, the theoretical foundation, much like other aspects of the literature review, contextualize the cultural meaning of water and how water is used in Dominica in a more complete spatial and temporal frame.

3.3.3 Research Questions

The purpose of this study is to increase the current understanding of the social construction of water in Dominica, and to explore how Dominican sociocultural perspectives influence or react to resource use and exportation endeavors. The study explores various questions regarding the extent to which the epistemological position that "*the water resources of the island are so abundant they should be shared (for profit) and globally distributed*" is actually widely shared by the people and government officials of Dominica.

The study questions have been explored (informed) by conducting background research with reports, documents, and newspaper articles and by interviewing local people. This research analyzes information from different sources and compiles a Dominican water narrative. Key study objectives of this study are to understand the social construction of water; the cultural meaning of water, contemporary patterns of water use, and to investigate complexities of the relationship between environmental change and bulk water exportation.

3.4-Sample

This study has aided me in the progress of building ethnographic research techniques. One goal of the study was to learn how to build hypotheses. One hypothesis was to see how people's views vary with demographic characteristics. The study is based on a small number of interviews sampled by age, gender, and residency; however, it can be argued that there are sufficient data to understand Dominican uses for water and knowledge of the environment. Efforts to stratify the sample were made to address any variance among the population. Based on background research and the 2013-scoping trip, age, gender, and residency were determined to have the greatest potential dimensions. The sample stratification that did produce noticeable patterns in responses was community residency. In this study, rural residents had more uses for more types of water and a better understanding of recent environment or weather shifts than urban residents. Age and gender had less impact on responses. Therefore, the sample design not only tested the stratification to find that the population was generally homogenous, but also gained an understanding of the cultural connection to water in Dominica.

According to Arnold (1970: 147), there is “a logic for small numbers research that takes advantage of the number of cases involved, and that has definite advantages for the development of theory not found in either the single-case study or the large number approach.” Arnold suggests three steps for a successful small sample approach.

1) Explicitly delineate the universe to which you eventually wish to generalize.

2) Spell out what appear to be the most important dimensions along which the members of this universe vary and develop a typology that includes the various combinations of values on these dimensions.

3) Use this typology as a sampling frame for selecting a small number of cases from the universe, typically drawing one case from each cell of the typology (1970: 147).

Step one of Arnold’s methodology, the universe I eventually wish to generalize, would be water resource construction and use within Dominican culture. Though the findings of this study do not uphold statistical significance, clear patterns regarding sociocultural attachments to water and experiences of changing climate have emerged. This study has broadened the current understanding of water resource use in Dominica.

Step two of Arnold’s methodology, important dimensions within the universe, drove the sample design. Age, gender, and community association were determined to be the most significant social factors that could cause any differences in interview responses. The sample framework was designed to include these dimensions, and the sample stratification addresses possible variance among the population. The sample framework and sampling technique were carefully designed, “social and behavioral scientists conventionally judge the validity and generalizability of findings by referring to classical statistical theory, which requires unrelated cases chosen without bias (that is, random sample) for valid analysis and generalization”(Handwerker 1998: 168). However, Handwerker (1998: 168) reiterates,

> Cultural data reflect the social (interactive) processes by which we construct our knowledge of each other and how social processes work. To select informants according to a random sampling procedure would defeat most of the purpose of ethnographers, which is to find people who know about the aspects of the culture that you want to learn.

A small snowballed sample was successful in collecting shared local (Dominican) experiences from willing and knowledgeable participants. The snowball method fit well with the small sample size because it directed me towards key knowledgeable respondents.

Step three of Arnold's methodology, selecting a small number of cases from the universe, was influenced by other literature on the topic. Toupal (2002: 95) suggests a small sample population of knowledgeable participants can produce confident findings. The interview questions were designed for this study to investigate a very basic understanding of water uses and weather changes. This information is such that any Dominican person would be more than qualified to participate in the study, "The social constructed nature of cultural phenomena means that any person who knows about a particular phenomenon participates with other experts in its construction" (Handwerker 1998: 169), and the sample stratification would address any response variance based on life experience. Statistical analyses of small samples have determined that there is in fact significant confidence in the data. If the information in question is shared among the whole population, validity can be achieved through a small number of interviews if the knowledge domain being study is homogenous (Romney et al.). Handwerker states, "Ethnographic findings based on information from small numbers of informants (3-36), can exhibit exceptional reliability (.90-.99) and validity (.95-~1)" (1998:169). This was taken into careful consideration in the study design.

The island of Dominica has a current population of 73,449. This study includes a total of 52 interviews, 32 formal interviews and 20 informal interviews. Background research and in-country scoping indicated that a stratified sample should be used. Different livelihoods and life experiences could affect data responses. Since this is a cultural study, it was significant to reach different facets of the population.

Many sociocultural features could be of interest in this study, but age, gender, and community membership (rural or urban) were determined as the most significant in efforts to achieve well-rounded data (Table 3.1). The study population is broken down into 8 categories of demographics:

Table 3.1 Stratified Sample Guide

	Urban Women	Rural Women	Urban Men	Rural Men	Totals
Adults (18-50)	4	4	4	4	16
Seniors (50+)	4	4	4	4	16
Total Interviews	8	8	8	8	**32**

This stratified sample was designed to ensure that a variety of Dominican perspectives on the research problem(s) were included in the data set. The specific strata (gender, age, and community membership) were chosen based on the influence they might have on how an individual used or perceived water. The importance of stratifying by gender was derived from an understanding of historical inequalities. Men and women have traditionally had different responsibilities, and therefore, may use or think of water in different ways.

Stratifying by age is important. The key incentives for sampling for two age groups (18-50 or 50+) were to observe a range in response of exportation motivations and climate change experiences. Typically, younger generations show more interest in economic development, while old generations may be more motivated by uprightness. Age-based sampling was also designed to gain a wide range of experiences with environmental change. Older generations have lived longer and may have a better insight into any changes in availability of water resources, seasonal weather patterns, or climate. Similarly, older generations have witnessed more political and economic developments in Dominica, and may have a different general perspective of resource exportation. In contrast, education has become more accessible, and therefore, younger generations may have a different standard understanding of Dominican government structures or ecological and climatic change locally or globally.

Finally, the third sample stratification was based on community membership: urban versus rural. In 2011, 67% of the population lived in an urban setting, and the Dominican rate of urbanization from 2010-2014 has been 0.18% (CIA World Factbook). Community membership (urban or rural) was sampled for in order to compare environmental attachment. Rural communities may have less access to pipe/tap water, and therefore utilize more natural forms of water. Rural residents typically have a better understand the status of natural resources and use them more frequently and in a variety of ways. Rural inhabitants often have a stronger attachment to *nature*, but urban residents are generally more involved in political or economic decision-making. Using the term nature to describe Dominica is relative, because the whole island is heavily vegetated with rich biodiversity, and many people obtain valuable ecological knowledge, especially regarding water. The potential divergences discussed above motivated the way in which the study sample was stratified.

The only requirements for study involvement are as follows:

1. Person is a citizen of Dominica.
2. Person fits into one of the four categories.

3. Person is willing to participate in the study.
4. 18 years of age or older

No vulnerable populations will be involved in the study. All data collected will be anonymously recorded in notes and write up.

Formal Interviews

In 2014, 32 formal interviews were conducted (Table 3.4). After consent to participate in the study was granted, each respondent took part in a semi-directed interview session. The sample population was not random; however, respondent demographics were established in order to collect data from a variety of perspectives. Specific characteristics that were sampled for were first and foremost, the respondent needed to be interested in participating in the study, and had to be at least 18 years old. After the initial recruitment, the gender, age (18-50) or (50+), and whether the person was a member of an urban or rural community was noted.

Table 3.2 2014 Formal Interview Demographics

	Urban Women	Rural Women	Urban Men	Rural Men	Totals
Adults (18-50)	5	4	6	4	19
Seniors (50+)	1	2	4	6	13
Total Interviews	6	6	10	10	**32**

Informal Interviews

A total of 20 Informal Interviews have been conducted as a component of this research. These informal interviews were guided by initial research questions developed as part of a hypothetical research proposal assignment in Anthropology 596B Caribbean Ethnography (2013). The information revealed in each informal discussion with Dominicans from rural and urban communities was used as a case study in a theory paper for Anthropology 507 Foundations of Applied Anthropology (Pickering 2013), and has been used in this research to generate the data collection instrument and to refine the guiding research questions.

Each of the 7 persons informally interviewed in 2013 supported government's decision to export water export. A key finding from the informal interviews was that a portion of the Dominican population does feel a moral obligation to share water resources due to their abundance. These findings became a driving force in the development of this study.

The 2013 informal interviews were conducted with employees of places I visited, like the hotel, bars, restaurants, and people setting near me on the bus. These respondents were not interviewed formally because the study was not yet approved by IRB, however field notes were taken. The information from the informal interviews with rural and urban Dominicans is not included in the data set, but was utilized to generate the data collection instrument. In 2013, four Dominican men and three Dominican women were informally interviewed. The following table indicates basic characteristics of the 2013 informal interviews (Table 3.2).

Table 3.3 Informal Interviews of 2013

2013 ID	Male	Female
1		X
2	X	
3	X	
4	X	
5	X	
6		X
7		X

In 2014, 13 informal interviews were conducted (Table 3.3). Like the informal interviewees of 2013, I often spoke with these points of contact briefly while they were working, and were therefore unable to participate in a formal interview. In 2014, ten Dominican men and three Dominican women were interviewed. The following table indicated basic characteristics of the 2014 informal interviews.

Table 3.4 Informal Interviews of 2014

2014 ID	Male	Female
1		X
2	X	
3	X	
4	X	
5	X	
6	X	
7	X	
8	X	
9		X
10		X
11	X	
12	X	
13	X	

The information from the informal interviews with rural and urban Dominicans is not included in the formal data set, but contributes to the qualitative portions of the analysis.

3.5-Measurement

A semi-directed survey form was employed to collect data in the 32 formal interviews. This data collection instrument consisted of 19 open-ended questions (See Appendix). Responses to the interview question set were hand written by the interviewer (Evelyn Pickering). Respondents were asked if they felt comfortable being voice recorded during the interview, and were given the option to decline. Many respondents preferred not to be voice recorded, therefore, the survey instrument is the primary form of data measurement in this study.

3.6-Analysis

This study consists of two analyses. The first is a literature review of contemporary documents and articles. These include news articles, academic journal articles, anthropological theories, and books on Dominican pre-history and history. This literary analysis is non-critical, and is used to contextualize the research problem.

The second analysis examines the data that was collected in Dominica. This is qualitative research, and the data is analyzed using qualitative methods. That being said, some of the interview responses can be quantified. Because the respondent sample population can be disaggregated by specific demographic characteristics, certain data sets can be quantified and compared (See Chapter Four on Findings). Due to the intentionally limited size of this sample population, no statistical differences can be detected. However, strong patterns in responses can be derived from comparison of the qualitative data.

3.7 Confidence in Data

The data in this study represents a portion of the Dominican population, and cannot be generalized as a universal Dominican perspective on the cultural meaning of water. That, however, does not suggest that the data lacks validity. Hammersley (1992) poses three criteria for ethnographic validity as,

1. The validity of knowledge cannot be assessed with certainty. Judge assumptions based on their plausibility and credibility.

2. Phenomena also exist independently of our claims concerning them. Our assumptions about them can only more or less approximate these phenomena.

3. Reality becomes accessible across the (different) perspectives on phenomena. Research aims at presenting reality, not reproducing it.

For the purposes of this study, it is assumed that each respondent has credibility as a Dominican citizen to discuss how they use water and what it means to their culture. Dominica is a very heterogeneous country with a homogenous water knowledge domain, and it is understood that the cultural meaning of water and water exportation have been shaped and influenced for hundreds of years. This study is not a complete narrative, but rather an introduction into understanding water resources complexities in Dominica. Finally, though the sample set only represents a small portion of the entire Dominican population, demographic variance provides data responses from differing perspective and increases data validity.

Because there was a significant amount of preparation put in to his study in the forms of background research and scoping, the data has diachronic reliability. Similarly, procedural reliability was achieved since the same person (Evelyn Pickering) conducted all data collection. Field notes and interviews were all recorded a consistent format. The interviews recorded by a digital voice recorder have an increased level of reliability, and can be quoted verbatim.

3.8-Methodological Assumptions and Limitations They Impose

This study included certain methodological assumptions. These assumptions have the potential of imposing limitations.

1. People living in an urban community have always lived in an urban community, and people living in a rural community have always lived in a rural community.

    - This assumption could limit the validity of any patterns revealed by the data based on residency and experience with or understanding of water resources.

2. Based on small sample theory, 32 interviews is a sufficient amount of data necessary to gain a better understanding of the research questions.

    - Although it can be assumed that water uses and characteristics can be generalized, the sample set of this study only represents less than 1% of the total population.

3. Gender roles are present in Dominican culture, and therefore, men and women use water differently and must be equally represented in the sample set for data validity.

    - Sampling for gender could impose cultural distinctions that may or may not be interesting or significant.

4. Background research on climate change, particularly regional drought, guided question formation.
    - Drought may not be the primary climatological change experienced by Dominicans.

These methodological assumptions and the limitations they impose have been considered in the data analysis process and determination of any findings.

Chapter Four- Findings

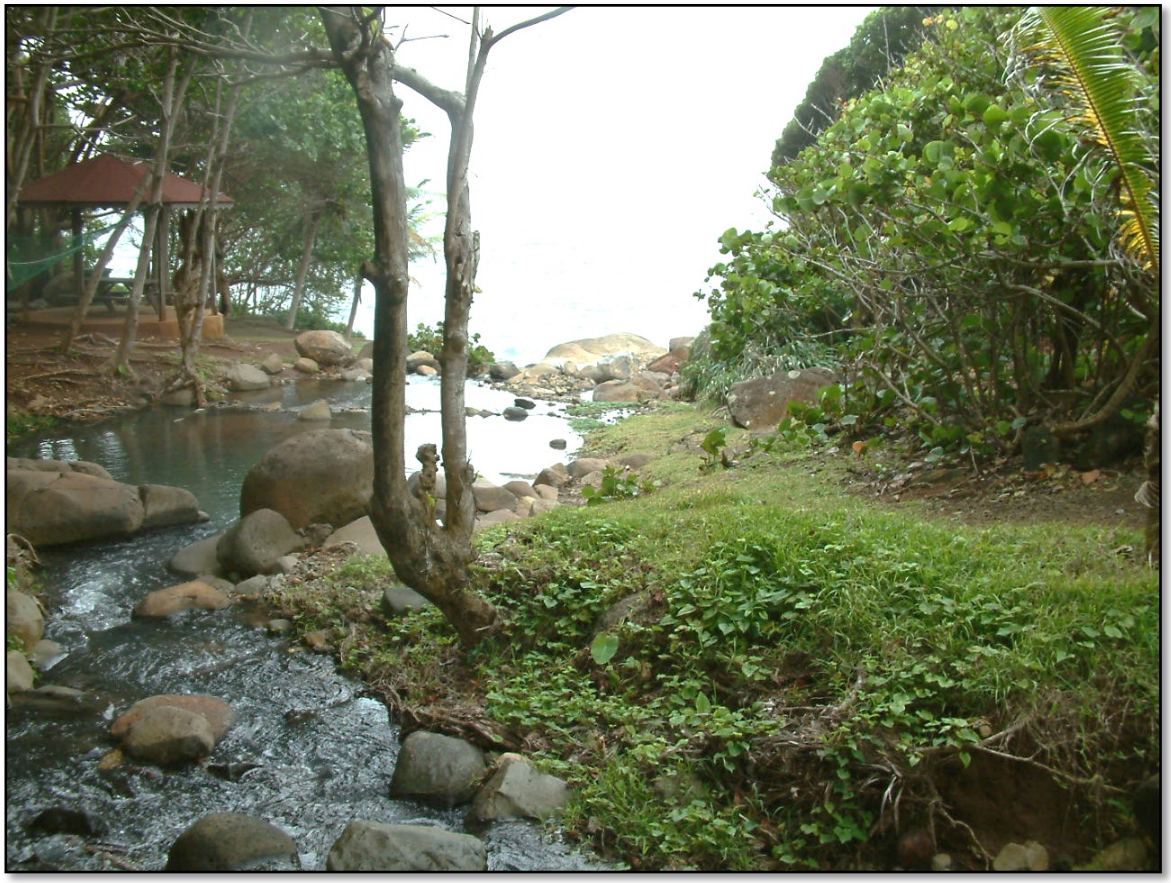

Figure 4.1 Crawfish Creek, Dominica

Dominica has been recognized as having a dramatic physical landscape that receives high rainfall that subsequently flows off of the high volcanic mountains as hundreds of rivers. Dominicans refer to their environment as both the *Land of 365 Rivers* and *Nature Island* (Figure 4.1). Water on Dominica is held as a communal property, and is therefore managed by the Department of Land, Housing, Settlements, and Water Resources in that manner. Nearly all of the homes in Dominica have access to clean running water. Within the historical memory and contemporary experiences of Dominicans there has been such an abundance of water that some have said that the water is a special blessing and thus “our water belongs to the world." Apparently because some of their government officials and many Dominican citizens hold this epistemological position, the country has begun to sell to foreign water industries and tourism boats millions, if not billions, of gallons of water. Water sales in Dominica have been discrete, so it is difficult to identify each method and amount of exportation. This

ethnographic analysis investigates Dominican epistemologies of water and the extent to which these have supported (if not caused) foreign water sales.

4.1-Brief Overview of Research Topics

These study questions have been explored (informed) by conducting background research with reports, documents, and newspaper articles and by interviewing local people. This research analyzes information from different sources and compiles a Dominican water narrative. Key study objectives of this study are to understand the social construction of water; the cultural meaning of water, contemporary patterns of water use, and to investigate complexities of the relationship between environmental change and bulk water exportation. These study questions have been operationalized as follows:

1. Do Dominicans have an accurate understanding of water in their environment?

2. Do Dominicans understand that global warming is causing climate change resulting in formerly rare droughts?

3. Do the citizens of Dominica currently use water for personal use sustainably and still have a massive water surplus?

4. Do Dominicans hold an epistemological position that their surplus is a blessing that they are morally obligated to share with a more arid world?

5. Are water sales by Dominica to foreign businesses an appropriate action by the government, who manages the natural water as a common property of the Dominican people?

4.2 Data Analysis

In 2014, 32 formal interviews were conducted. The following section provides a deeper analysis of the interview questions asked in the formal interview data collection. Although this is a qualitative ethnographic study on the cultural meaning of water in Dominica, some of the data can be quantified and compared numerically. Some of the analysis is best understood through interview quotes, while a more complete interpretation of other research questions can be gained through tables. This mixed methods analysis will identify the findings of specific interview questions to support the larger research findings of this study. T-tests were run on these data, but due to the sample size and slight differences between sample stratification group sizes, any statistical differences that may be present could not be detected. Data from the smaller sample groups were not merged in order to run statistical analysis because the value of the stratified sampling would be lost.

4.2.1 Dominican Water Types and Uses

❖ When asked, *what types of water do you have in Dominica*, 20 different types of water were identified by interviewees: sea, fresh rivers, sulfuric rivers, springs, rain, lakes, swamps, waterfalls, mineral water, Freshwater Lake (Specific lake in Dominica), Boiling Lake (Specific lake in Dominica), sulfur ponds, sulfur lakes, aquifers, steam, public stand-pipe water, Atlantic Ocean (Different from Caribbean Sea), Sous (Creole for water that drips from rock walls or mountains) (Figure 4.2), Mayan Water (Hot water), and Glogayak (Creole for cold mineral water). The knowledge domain of water is complex and richly nuanced.

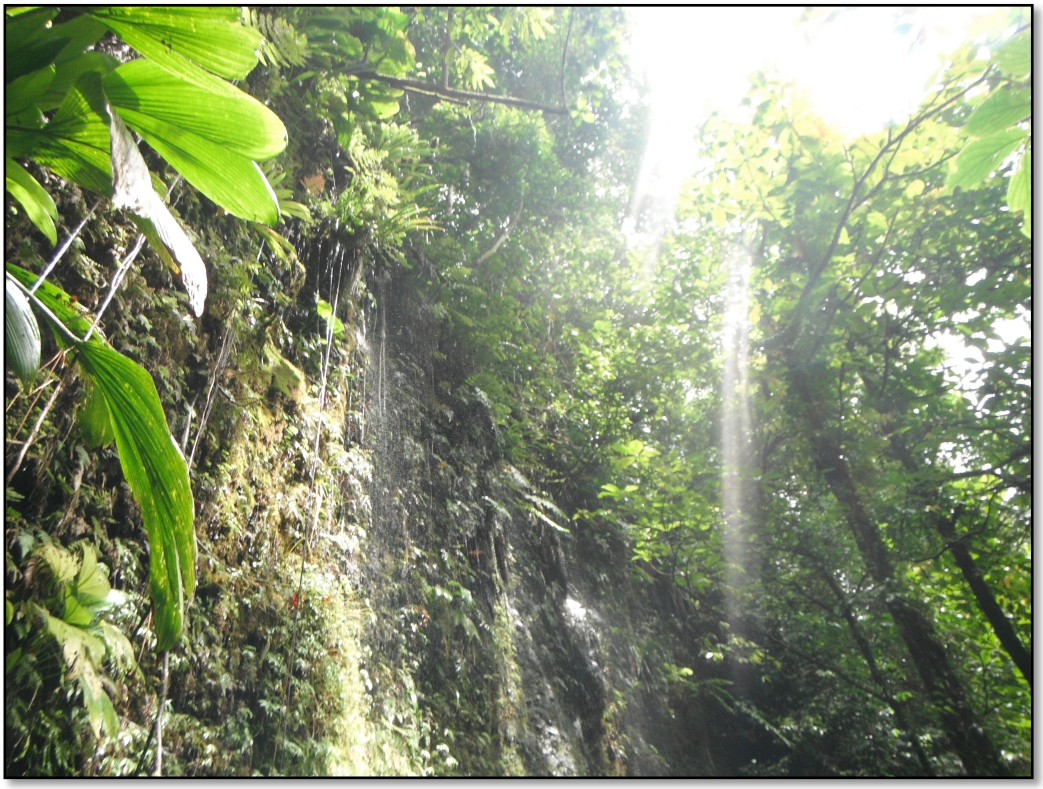

Figure 4.2 Sous is a Creole Term of the Water that Drips from Rock Walls

Individual respondents each identified between two and 10 different types of water on the island. Response ranges were categorized: Low (less than 3), Medium (between 3 and 5), and High (more than 5). Fewer types of water identified indicate less water knowledge. Table 4.1 below displays the number of respondents who fit into each of the water knowledge categories. Almost no people lacked a complex understanding of kinds of water. Overall, the sample of 32 formal respondents can be categorized as knowledgeable about the water domain.

Table 4.1 Number of Water Types Identified

Knowledge Domain	Respondents within Domain
Low	1
Medium	18
High	13
Total	32

The sample was stratified by gender, residence, and age. When asked about water types, men and women generally exhibited medium to high levels of knowledge in approximately equal percentages; therefore, the stratification by gender did not provide additional understandings of what people know of water types.

Table 4.2 Differences in Response by Gender

	Low	Medium	High	Total
Male	1 (5%)	11 (55%)	8 (40%)	20 (100%)
Female	0 (0%)	7 (58%)	5 (42%)	12 (100%)
Total	1 (3%)	18 (56%)	13 (41%)	32 (100%)

Table 4.3 documents differences in water knowledge based on the residence of the respondent. The majority of urban respondents identified a medium level of water types; whereas, the majority of rural residents identified a high number of water types. This is consistent with the observation, informal interviews, and formal interviews that people in the countryside identify more water types than those who live in the city.

Table 4.3 Differences in Response by Community Type

	Low	Medium	High	Total
Urban	0 (0%)	13 (72%)	3 (18%)	16 (100%)
Rural	1 (6%)	5 (31%)	10 (63%)	16 (100%)
Total	1 (3%)	18 (56%)	13 (41%)	32 (100%)

Table 4.4 shows that the majority of respondents in each age category (18-50 and 50+) identified a medium level of water knowledge based on the number of types they identified. There was no obvious distinction between age groups in the number of reported water types. Age may be significant, as predicted before this study, when a larger sample permits more refined age categories to be developed. The early qualitative informal interviews repeatedly suggested that older people would be more knowledgeable about types of water than younger people.

Table 4.4 Differences in Response by Age

	Low	Medium	High	Total
18-50	0 (0%)	11 (58%)	8 (42%)	19 (100%)
50+	1 (8%)	7 (54%)	5 (38%)	13 (100%)
Total	1 (3%)	18 (56%)	13 (41%)	32 (100%)

In general, the respondents were very knowledgeable about the types of water that exist in Dominica. This is a well-shared and homogenous knowledge domain. While there were no statistically significant differences in knowledge as measured by the number of types of water, there were clear trends in the overall sample when stratified by gender, residence, and age. It is interesting to note that the majority of the respondents who indicated a high level of water knowledge resided in rural areas.

❖ When asked, *Are these types of water used in different ways by Dominican people?*, interviewees provided a range of responses. Some water types are used for extremely specialized purposed, like bathing in sulfur ponds to alleviate skin conditions or joint pain. In contrast, rain or river water can be used for a variety of things, like drinking, bathing, cooking, cleaning, construction, etc. Respondents provided the following statements to describe the ways in which water types are used.

- *Seawater, we don't really use it on the island. Just fishing. The springs and the lakes we use it to produce our local spring water. Bottled water. The tap water comes from the reservoir, like the lakes and so on. Some people use rain for washin' purposes, drinking, and also bathing and so on. River is used for leisure time, like to swim, and some people wash their clothes. And people use the public taps* [outdoor stand pipes] *to wash their car.*

- *Seawater, you use it to bathe. The seawater can be used for medical, as well as the hot water, the sulfur water. If you have an accident it can be used for pain. Drinking water comes from the rain, the river, or our main source of water the tap. That is for drinking, washing, domestic use. Spring water come from the river. It is the same.*

- *The sulfur, most people use it when their body hurtin'. The seawater you can use for the same thing as well. They treat different things. People use the river to wash, to bathe. Drinking water, that's a process. It has to pass from the river, then they have a dam, then they clean it up. Whatever they have to do it's a process by the water company. Rainwater is to wash and drink.*

- *Seawater, if you got an injury, like a sprained ankle or something, you could like go and bathe and rest yourself. The river, the freshwater, you could use it to drink, bathe, or wash. The sulfur water helps with a rash like medicine. The rainwater is good for drinking and washing, that's all. If the tap water is cut off, you could use the rainwater instead. The lake is to go have a look, or bathe and stuff, and hydroelectricity. On the island we got hydroelectricity. That's a main source for electricity on the island.*

- *Well with me? If I get my spring water I'll drink my spring water. The sulfur water is good but it's too much chlorine* [to drink], *but I do everything, wash, everything. If I don't buy spring water I use rainwater. We have a water catchment for rain. We don't have any river here* [in this village].

- *The sea, we use it for fishing. We usually use the river to wash, bathe. Sulfur is to soak yourself if you have any pain or something with your skin. I drink spring water. Rainwater, usually, when the tap water run out, we use rainwater. Tap water runs out once in a while.*

- *Well the sea is basically used for fishing. That's the number one thing people do with the sea. It's also used for tourism, recreational purposes. I only have to put the positives? Because pollution, I have to include that. People just throw a lot of stuff in it. Okay, fresh river is used for bottling. We have water-bottling companies here. Also recreational, people go there to bathe and stuff. Even fishing also, certain areas have certain types of fish people go over to get. They call them crawfish and stuff like that also. Sulfur water, what I've heard, is used for medicinal purposes, like if you have a rash or anything like that you could go there, also to clean the pores of your skin, recreational, again, people just go there to relax and stuff, and there's a certain one that is used for a cleanser and people drink it. It is from the sulfur deposit itself, but it is not hot, its actually normal temperature water up in the sulfur spring in Soufriere. It's like a little stream. I really don't know about spring water. I don't see any use for that. Rainwater is used, its collected, and people use it to water their plants, like farmers do it on the plantation, because you never know when it could be a drought and they have to have a sufficient amount of water for their crops. People also use it as drinking water, preferably when its hurricane season because at that time water lines can get damaged and stuff, and so you want to have a backup. I actually went through that experience.*

- *For drinking purposes, there is the river and we have water bottles. For recreational purpose, we have the rivers, well everything. Usually in the summers we go to the sea, rivers, the lakes. I know they are trying to use some of it to make electricity. They use the waterfalls for that. The spring in Loubiere is used for alcoholic beverages. Loubiere is also used for bottled water, and there is another company but it's not for local use.*

- *Not really, most of them you just use the same: to cook, to drink, to shower. I'm not sure for river water, but you can drink rainwater, the spring water, and the sulfur water is a medicated water to soak in if you're sick or something like that. In the sea you can go diving or swimming.*

- *The seawater is used for bathing, fishing, water sports. That's it for the seawater. Fresh river water is for fishing, bathing, washing, river tubing. The sulfur water is made into sulfur ointment for medical use. Spring water is for drinking. Rain is for bathing, washing, cooking. Rainwater sometimes is to flush toilets when people have no pipe water. That's it.*

- *Well the sulfur water is good for in the inside* [of the body]*, good for skin, clean, good for rheumatism, you have to soak in the water. It's like a medicine. The fresh river water is a good water because it's always running down. It is always cold. We drink the sulfur water* [in this village]*. It's heavier than the river water. The rainwater is good to drink. It's lighter than the sulfur water. They have a different taste. It's good to drink the rainwater.*

- *The sea for fishing, diving, snorkeling. Fishing is a form of revenue, a form of livin'. River water is the same. There are some freshwater fish. People use it in terms of income and recreation too. In terms of tourism, you have some kayaking, river tubing, stuff like that I would say. Tourism, yeah. Also used in terms of agriculture, to water the plants and everything, soil irrigation. Sulfur is really like, a form of umm, it's like a cleanser to the body. It purifies the body. Spring water is for the home, drinking, bathing, all of that, yes. Rain is the same thing, soil irrigation, agriculture, drinking. There are certain places, because of the altitude, that might find it difficult for the pipe water to be pumped up, so they rely on rainwater assistance. So they use it for washing, drinking…*

- *Fresh river water, we drink, we cook* [with]*, bathe, wash. These are the main ones. We do the same thing, bathe, because different people they like rainwater better than the tap water. We just use it all. I like rainwater better than the tap water. We be usin' the water, whatever we have. Like the seawater, we boil if we haven't got other and distill it. I'll bathe in the seawater; I'll bathe in the river. So whatever we have, we use. We use the water for any purpose, any kind of purpose. Water in Dominica is for all-purpose. We use seawater massage your body when its sore, but I go on the Atlantic side because it has more salt than the Caribbean Sea. That is real thing. I know that. More salt is more healing. The elderly, people, go on the shore. They cannot swim, but splash it. It's good for the joints.*

- *Right now, seawater I don't think, we don't really use seawater in Dominica. Fresh river water is for irrigation, plants, also house usage. The sulfur water is for medical use. We use spring water for selling in the market, as drinking water and making beers and different beverages.*

Also it [spring water] *is used for household use. Rainwater is used for household use, irrigation, for livestock, and just a backup water for in case…*

- *The sea is for purposes for fisherman to go and fish, and people bathe in the sea, and travelling on sea to go to Martinique and St. Lucia, they travel by boat on the sea. The main thing is that fisherman fish in the sea though. The rivers are there to get our river bath, and people go there and fish sometimes, it's similar to lobster, crayfish.*

There were distinctions between urban and rural community member responses. Although the possible uses were consistent throughout all of the interviews, for many of the water types urban respondents described how rural citizens utilize the resource rather than what they themselves do. Where members of rural communities harvest many types of water, urban dwellers often use *pipe water*, which can be accessed in all homes as well as from pipes that are located amply throughout larger towns. From these data, it can be deduced that people living rurally have a closer relationship with nature and rely natural resources, like water, differently.

❖When asked, *do men use water differently than women*; most respondents stated that there was no difference. A few respondents described how occupational differences contribute to ways in which men and women use water differently. Men use water for construction, washing their vehicle, agriculture, etc. In Dominica, men wash their vehicle daily, so this is culturally significant. Water is used for mixing cement in construction. Men generally work in construction, and women do not. Women at home use water for washing, cleaning, and cooking. The use of water for personal hygiene was also reported as being different for men and women (Table 4.5). Respondents appeared uncomfortable when asked about gender differences in the use of water. It is possible that this discomfort stems from an unwillingness in the Dominican culture to discusses personal hygiene. I did not probe into hygienic uses of water further in an effort to maintain the respondents' willingness to continue to participate in the interview.

Table 4.5 Water Uses Based on Gender

Response	Times Mentioned
No difference	24
Men use water for construction, washing their vehicle, agriculture, etc.	6
Women use water for washing, cleaning, and cooking	5
Difference Hygiene	3
Total	38

In order to understand how men and women perceive gender differences in water uses, male and female responses were compared. Contrary to expectations based

on scoping conversations, most participants indicated that there were no differences in the ways water is used by men and women (Table 4.6). The differences that were mentioned could be classified as traditional gender roles, i.e. housework versus paid labor.

Table 4.6 Differences in Response by Gender

	Different	Not Different	Total
Male	4 (20%)	16 (80%)	20 (100%)
Female	4 (33%)	8 (67%)	12 (100%)
Total	8 (25%)	24 (75%)	32 (100%)

Stratifying the sample by residence did not impact the responses to whether or not men and women use water differently. Table 4.7 demonstrates that most urban participants and most rural participants claimed there were no differences in the ways men and women use water resources. However, of the respondents who did indicate there was a difference, most of them lived in rural communities. Agriculture was noted as one way in which men and women use water differently, which is done in the country, so this slight variation is consistent with respondent residence. Though the overall response was that there are no differences between gender uses from both rural and urban residence, those who did indicate ways in which men use water differently than women were rural residents.

Table 4.7 Differences in Response by Community Type

	Different	Not Different	Total
Urban	3 (19%)	13 (81%)	16 (100%)
Rural	5 (31%)	11 (69%)	16 (100%)
Total	8 (25%)	24 (75%)	32 (100%)

The age of respondents did not greatly influence whether or not gendered differences for water uses were recorded. As demonstrated in Table 4.8, the majority of respondents between the ages of 18 and 50 and the majority of respondents 50 years of age or older stated that there were no differences in the ways men and women use water. This contrasts with what was anticipated. From historical research and preliminary scoping interviews, the expected response was that older generations would maintain more strongly distinguished gender roles, and therefore more frequently respond that men and women did use water differently. A larger sample would allow for more developed age categories, which could reveal age having a more significant impact in response patterns.

Table 4.8 Differences in Response by Age

	Different	Not Different	Total
18-50	5 (28%)	13 (72%)	18 (100%)
50+	3 (21%)	11 (79%)	14 (100%)
Total	8 (25%)	24 (75%)	32 (100%)

The most significant distinction within the sample population was between rural and urban residents, and male and female respondents. Age did not greatly impact the water type identification range. According to the respondents, men and women generally share household responsibilities, however, in some families, it is more common for women to manage tasks like cooking, cleaning, or washing. Some occupational positions filled primarily, if not completely, by men, like construction, agriculture, or fishing, signify that there is a gendered divide in water uses. Though social class was not a feature of the sample stratification, owning a vehicle in Dominica is a social signifier. Several respondents mentioned men use water to wash their vehicle, and in this sense, it is not only a gendered but also a class specific use of water.

Respondents provided the following statements regarding gendered water uses, and most claimed that there were no gendered differences in water use:

- *Both use it the same way.*
- *Men use it the same.*
- *Basically the same task, the same chore. We share the trouble and time.*
- *I would say the same task. We use it to bathe, clean, wash, whatever you can use water to... Flower in the garden. Just use it normally.*
- *The same uses.*
- *About the same.*
- *Always the same: clean, wash, bathe.*

Some respondents provided examples of ways in which men and women use water differently:

- *Men use it for construction. They use it for washing their vehicles, doin' whatever they have to do. Women wash, clean.*
- *Yeah* [laughs nervously]*, women always have to take care of their special sanitary. Different hygiene.*

- *It depends. Some women and some men are different. Some more and some more are more hygienic than the others.*

- *I think, if there are differences, it might be very very minor differences based on the shower time of a man than a women, and maybe stuff like that. Women maybe take a little bit longer in the shower. Men wash their vehicles. That one takes a lot of water.*

- *Well men usually wash their vehicle.* [Both use it for] *cooking, washing their hair, washing their clothes…*

- *Well the rainwater, they* [women] *use it mostly to wash, because it soap more, more than the pipe water. Men and women wash clothes, wash dishes.*

- *Men use water for building houses and fire, so water is a key 'men thing' in our community for all construction purpose, farming, everything that you do you need water. Water is a key purpose on the island.*

One respondent described how there used to be more differences in how men and women used water, but that now both genders share household and workplace responsibilities. The gendered differences that once existed in Dominica have decreased and water use between men and woman lacks major divisions.

- *It depends. Women used to do everything* [around the house]*, but men do it now, nowadays.*

❖ When asked, *how would you describe the availability of water on Dominica* the response was overwhelming positive. Every interviewee described the resource as widely available and easy to access. The following statements describe the availability of water in Dominica in the words of Dominicans.

Most respondents described an abundance of water resources:

- *Exceeding, too much. We got, some say, 365 rivers. One river for each day you know.*

- *Water, water, water. We can get enough water in Dominica. There is a lot of water.*

- *Water is abundant.*

- *It is plentiful. On the island we got 365 rivers. Normally they say a river for each day, except a leap year.*

- *It's always available. We don't have a problem in Dominica at all.*

- *It exists in abundance. We can just open the pipe and get water. You can buy water, but you don't need to. It's clean.*
- *It's in abundance, you know. Yeah.*

- *Water is available all the time.*

- *It's a lot, and they all taste different.*

- *Well we have an abundance of water. That's what we can boast on. Well in some areas it's kind of dry, but mostly we have a river for everyday of the year, 365 rivers. That's why we can boast up, we have an abundance of water, yes.*

- *I would say it's quite easy in Dominica* [to access water]*, especially if you go to the countryside you'll find lots of rivers so it's much easier. Although sometimes when they have to work on the main pipe, they have to shut the water* [off]*, we still doesn't really bother about that, because people got fountains with rainwater to use it, and most people got big drums and they always have water. As a matter of fact, before they start working they will give you a sign and say, 'okay at 10:00, or at 9:00, or at 8:00 they goin' to shut it down,' so it's exactly before 4 or 5 in the morning we get up and start filling them buckets, so we don't worry about it. They communicate with people. We know exactly, yeah man.*

- *We don't have a problem in Dominica. We have a lot of water.*

The following quote is from one respondent that mentioned some people in very remote places lack access to pipe water, but still have sufficient rain or river water:

- *Well, availability to the entire population? Only a few areas it's very difficult because a majority of the islands population is on the coastal area, so people like way up in the mountain tops maybe have to rely on, for example rainwater, because they will have a lot of, you know, agriculture growing up in that area definitely. I think it's mainly those people* [that could ever have a shortage]*, but the coastal areas, right now I would say over the past few years, a steady improvement in the water for people, because a lot of people that didn't have water before, the government or whoever it is, was making that one of the main issues. In*

case of a fire or in case of an emergency if you don't have a standpipe around. Certain areas where homes were built there was not a lot of, like a not heavily populated area or small communities, would be affected by fires and stuff like that, people were dying, a lot of stuff would happen. Over the years I think they've done a good job. I would say most of the population has good availability of water now.

In general, Dominican participants in this study described an abundance of water on the island, regardless of age, community membership, or gender.

4.2.2 Dominican Water Exportation

❖ The notion of Dominica having a moral responsibility to share water based on its abundance is popular among interviewees. When asked, *have you heard the idea that Dominicans have so much water that they morally should share their surplus with the world*, 25 out of the 31 respondents said yes. Six interviewees had not heard this philosophy. The table below quantifies the responses[1] (Table 4.9).

Table 4.9 Number of Respondents that had Heard of Dominica Having a Moral Responsibility to Export Water

Response	Response Count
Yes	25
No	6
Total	31

Age, gender, or community membership does not seem to considerably influence how respondents answered this question. According to this sample population, respondents generally feel a moral responsibility to share water with the world. This homogenous response has been documented in previous studies, as well as in this one. Some ways in which strong moral codes and generosity are held as respected values within Dominican culture were described in the literature review, and these data echo that cultural feature. Similarly, most respondents heard local discussion that Dominica has a moral responsibility to share water in times of need and regional drought, and this will be discussed in further detail below (Table 4.13).

Table 4.10 demonstrates that the majority of male and female respondents had heard of Dominica exporting water for moral reasons.

[1] One respondent chose not to answer when asked, *Have you heard the idea that Dominicans have so much water that they morally should share their surplus with the world?*

Table 4.10 Differences in Response by Gender

	Yes	No	Total
Male	16 (84%)	3 (16%)	19 (100%)
Female	9 (74%)	3 (26%)	12 (100%)
Total	25 (81%)	6 (19%)	31 (100%)

According to Table 4.11, most of urban and rural residents had heard of Dominica exporting water for moral reasons.

Table 4.11 Differences in Response by Community Type

	Yes	No	Total
Urban	11 (73%)	4 (27%)	15 (100%)
Rural	14 (88%)	2 (12%)	16 (100%)
Total	25 (81%)	6 (19%)	31 (100%)

Table 4.12 demonstrates that the majority of respondents between the ages of 18 and 50 and the respondents 50 years of age and older had heard of Dominican exporting water for moral reasons.

Table 4.12 Differences in Response by Age

	Yes	No	Total
18-50	14 (78%)	4 (22%)	18 (100%)
50+	11 (85%)	2 (15%)	13 (100%)
Total	25 (81%)	6 (19%)	31 (100%)

Stratifying the sample population did not generate any statistically significant patterns in this specific data set. Gender, age, and community membership were not associated with knowledge of a moral influence on the exportation of water. These data indicate a generalized Dominican awareness of that cultural concept by the respondents.

❖ Most respondents had heard the idea that Dominica has a moral responsibility to share water when neighboring countries are suffering from drought. When asked, *Can you tell me about when and where you first heard the statement above?,* the 'when' varied greatly, whereas the 'where' was fairly consistent. Many of the respondents chose not to answer this question. From the responses that were given, the timeline spanned between one and18 years ago. Some respondents gave a more generalized answer, for example "recently" or "a long time ago." From these responses it is not possible to determine when the statement developed. However, for the purpose of this study, it is more significant that people had heard of it at all. Again, very few interviewees responded about where they first heard that Dominica has a moral responsibility to share its water, but the most common response was that when there is a drought on other nearby islands people talk about it on the streets or radio.

The following responses highlight the general local experiences with the morality of sharing water:

- *A lot of people think of it* [sharing water with places that don't have any]*, with like Antigua and so on, and that we should be exporting more bottled water to Caribbean islands.*

- *I know they been saying to export water, bottled water to places that doesn't have. That's what they been talking about.*

- *Yeah, I can remember one time was one Grenada was in a drought and Dominica was willing to give. There was an agreement to give it away, because we have a lot of water. We can share. We can share, of course, there is enough we can share.*

- *The whole Caribbean had a drought, I think three years ago. Three or four years ago. The whole Caribbean had a drought and were expecting to import our water from Dominica. They keep talking about it.*

- *It had to be recent, like last 20 years. Especially islands like Antigua, for example, they are very close to us and we have a good relationship between the two islands where we visit each other a lot and so based on that we got to know about them and their situation and the don't have no rivers, no waterfalls, nothing. So they get water from us.*

- *I haven't really heard it on the radio to tell you honestly. It's more like local island gossip. I would call it that. I had an experience in Antigua when I went over there and I couldn't even drink the tap water because it wasn't safe to drink it at all. Washing and stuff you could use the tap, but cooking and everything is bottled water there. So that's when whatever they were saying* [on the streets] *I actually believed them. It's happening there. I experienced it. I wouldn't know about other places. Antigua is the main place. Their water problem is a big one.*

- *There was talk when we exported water to Antigua. I don't know about internationally, but regionally.*

- *Well what I find is that we have so much water and we importing water. That is the problem I have, because we have drinking water and stuff from Dominica. We have so much water, why are they importing water too. I haven't heard of exporting water. I know they're importing. That's what I have a problem with.*

- *It comes up all the time. All the time, and they have assistant people do it, for example, during disasters where there is a shortage of water, they will ship water in containers to help, to assist.*

- *It's been like a couple years, 3, 4 years right about that time. We have to offer water during disasters.*

- *When people talk about exporting water to other countries, it is for businesses or if there is a disaster, Dominica is the key place that gives water to other countries. Like in St. Lucia recently, they had no water and Dominica had to send water.*

- *I can't remember where* [I heard that]*, but they spoke about it; sending it to other countries where there's a scarcity of water. Maybe more than 10 years ago.*

Other respondents had heard this concept discussed on the radio or in local gossip:

- *Once in a while, it's on the radio, and we talk about it on the streets.*

- *I had this discussion with some people sometime back, and seeing that Dominica has 365 rivers, there's plenty we can export. What we hearin' now, the water is declinin'. We haven't got 365 rivers. They say that, but I know that. Dominica hasn't got 365 rivers again. The sun it hot and the river tends to go down. Now some are streams that used to be rivers. But we don't really lack water in Dominica still. We don't lack that.*

❖ The following table (Table 4.13) demonstrates how interviewees responded when asked, *How do you believe this statement developed?* Most of the sample had heard this perspective, and the most common response was that the idea that Dominica has a moral responsibility to share water actually developed out of the need of other places that lack the resource. Seven respondents attributed the statement development to political or local leaders, and one respondent felt economic opportunity triggered the concept development[2].

[2] 10 people chose not to respond, and two interviewees were unsure when asked, *How do you believe this statement developed?*

Table 4.13 How Dominica's Moral Responsibility Developed

Response	Response Count
Other Places Lack Water (Drought, Natural Disaster, etc.), and/or Dominica has an Abundance	12
Political or Local Leaders	7
Economic Opportunity	1
Total	20

Men and women provided different perspectives on the development of morality as an explanation for water exportation. Table 4.14 illustrates that the majority of men attributed the development of the moral justification of exporting water to drought in other places. In contrast, more women identified politics as the chief incentive. Only one respondent identified economic opportunity as the primary reason to export water.

Table 4.14 Differences in Response by Gender

	Drought in Other Places	Political	Economic	Total
Male	9 (69%)	3 (23%)	1 (8%)	13 (100%)
Female	3 (43%)	4 (57%)	0 (0%)	7 (100%)
Total	12 (60%)	7 (35%)	1 (5%)	20 (100%)

Community residence was also associated with participant response. Table 4.15 indicates that most of the urban residents identified that drought in other places influenced the development of the concept that there is a moral obligation to share water. Rural respondents were divided in their perception that either regional drought or national politics influenced exportation. The political turmoil in Dominica's past that was discussed in the literature review may contribute to residual skepticism by rural communities of the government's motivations and actions,

Table 4.15 Differences in Response by Community Type

	Drought in Other Places	Political	Economic	Total
Urban	7 (88%)	1 (13%)	0 (0%)	8 (100%)
Rural	5 (42%)	6 (50%)	1 (8%)	12 (100%)
Total	12 (60%)	7 (35%)	1 (5%)	20 (100%)

Age was not associated with the respondent's beliefs that were documented about the origins of Dominican moral responsibility as a motivator to share water. As presented in Table 4.16, regardless of age, most of the respondents between the ages of 18 and 50 and those 50 years of age or older indicated that drought in other places caused the development of the concept.

Table 4.16 Differences in Response by Age

	Drought in Other Places	Political	Economic	Total
18-50	6 (55%)	5 (45%)	0 (0%)	11 (100%)
50+	6 (67%)	2 (22%)	1 (11%)	9 (100%)
Total	12 (60%)	7 (35%)	1 (5%)	20 (100%)

Gender and residency seemed to impact Dominican perspectives on the origin of the idea that Dominica has a moral responsibility to share water with other countries. More men than women identified regional or global drought as the primary motivation for exporting water. Similarly, more urban residents than rural residents noted regional or global drought as the main motivator. Age was not significantly associated with differences in these perceptions.

The following quotes explain how the respondents believed the concept developed. Some believed the response to share water developed out of the need observed on other islands:

- *I guess it came up from the abundance of water we have and some of the other places have not as pure and clean as ours. As a good gesture to share or export water here.*
- *It's if they have a disaster, and if we know they suffering on water, the government and we the people come together and decide if they don't have water we send it. The government sent water, businesses sent water, and even me myself I sent water to people I knew.*
- *We have too much water, we have a lot of water, so why not. General view in Dominica is we have too much water.*
- *Some places don't have water, and we in Dominica have 365 rivers, so to share it is good.*
- *I'm not really sure, but I suggest that it was probably demanded for, like Antigua. They transport it from the sea, because there water is not drinkable.*
- *I think to help people out, because we have a lot.*
- *Because some countries have a scarcity of water, some of them have no water. They have to use desalinated water: Antigua, Barbados.*

Others stated that the idea developed through the government:

- [It developed] *through the government.*
- *I guess it came from the ministry and government officials, and its not necessarily places that don't have water. They export it all over.*

Some respondents referred to the economic opportunity as the trigger:

- *It was a good opportunity, but at the same time its promoting Dominica as well.*
- *Well, if the other in need of water, then the export*[er]*s in competition. There are places that need the water. They have no water.*

❖ When asked, *How long do you think this concept has been accepted by Dominicans?*, the response dates spanned from over the last year (2013-2014) to the beginning of Dominica's independence. The most common response was vague on a specific date, but maintained that it has been accepted for as long as the concept has been around. Four respondents mentioned that other Dominicans accept water exportation for the economic opportunities, rather than moral responsibilities. The table below summarizes how long respondents thought other Dominicans had accepted the idea that there is a moral purpose to export water[3] (Table 4.17).

Table 4.17 How Long Dominicans have Accepted Exportation

Response	Response Count
As long as its brought in income	5
Its been accepted since the idea developed	4
A long time	4
3-4 years ago	2
Since Dominica's independence	1
Over the last year (2013-2014)	1
Total	23

No clear response pattern emerged from these data. Most of the respondents chose not to answer this question, where others gave very vague responses. Some interviewees provided specific answers, but there was no correlation between response and sample strata.

[3] Nine interviewees chose not to respond, and four stated that they were not sure when asked, *how long do you think Dominicans have accepted this concept?*

❖ When asked, *Do you agree that Dominicans have a moral responsibility to share their water with the world?*, the majority of the respondents did feel a personal obligation to share the abundance of water. Four interviewees, however, thought water should only be exported if Dominica benefits in some way. The tables below quantify each response[4] (Table 4.18).

Table 4.18 Respondents Opinion on Water Exportation

Response	Response Count
Yes	23
Yes, but only if compensated	4
Total	32

Gender stratification is not associated with perspectives on the morality of exporting water. Table 4.19 shows that all of the people interviewed felt a moral obligation to share water with others, however, some men and even fewer women felt that the island should be compensated somehow for sharing the resource. Overall, generosity is a cultural standard held by both male and female participants.

Table 4.19 Differences in Response by Gender

	Yes	Yes, with Compensation	Total
Male	14 (82%)	3 (18%)	17 (100%)
Female	9 (90%)	1 (10%)	10 (100%)
Total	23 (85%)	4 (15%)	27 (100%)

Residency had little impact on response variation among participants. Table 4.20 demonstrates that all of urban and rural residents felt a moral responsibility to share water. A similar small number of respondents from rural and urban communities felt that Dominica should receive some sort of compensation in return for water exports. Regardless of place of residence, respondents maintained that Dominicans have an obligation to share their abundance of water.

Table 4.20 Differences in Response by Community Type

	Yes	Yes, with Compensation	Total
Urban	10 (84%)	2 (16%)	12 (100%)
Rural	13 (87%)	2 (13%)	15 (100%)
Total	23 (85%)	4 (15%)	27 (100%)

[4] Five interviewees chose not to respond when asked; *Do you agree that Dominicans have a moral responsibility to share their water with the world*?

Table 4.21 indicates that all of respondents felt a moral obligation to share their abundance of water, however, some of the population between the ages of 18 and 50 felt there should be compensation for the gesture. The Dominican respondents 50 years of age or older category was the only stratification of the sample that consistently agreed as individuals that they felt a moral responsibility to share water with other countries without any mentioning compensation. The past experiences of the older generations, particularly those in the beginning years of Dominica's independence when access to many resources was problematic, may uphold a stronger connection to generosity.

Table 4.21 Differences in Response by Age

	Yes	Yes, with Compensation	Total
18-50	12 (75%)	4 (25%)	16 (100%)
50+	11 (100%)	0 (0%)	11 (100%)
Total	23 (85%)	4 (15%)	27 (100%)

Gender and age seem to impact Dominican perspectives on water sharing. Although every respondent agreed that Dominica has a moral responsibility to share water, more men felt the island should be compensated in some way than women. Similarly, more respondents between the ages of 18 and 50 noted compensation should occur than respondents 50 years of age or older. Community residency is not significant for these data.

The following quotes provide a better understanding of how Dominican people feel about exporting their water. Most of the respondents that participated in this study agreed that there is moral importance in sharing water:

- *We never have a shortage of water, and when other islands are struggling it always comes to mind.*
- *We can share. We can share, of course, there is enough we can share.*
- *Yes, well see there is a lot of places that don't have. To not share is selfish.*
- *It's good to share it. That's a basic necessity and we have it in abundance. We just have to share it because it improves people's lives. That's part of the human development index or human development goals, access to water. That's an indicator.*
- *It's moral. It's good to be sharing.*

- *I think it's a good thing. We have an abundance. We get most of or electricity from hydro, but we could still use geothermal. I don't see a problem with sharing. The extra is good to share.*

- *Yeah, because there are somethings… everybody is in need of something, and there are some things we can't supply for ourselves that others supply for us.*

- *I would say I agree.*

- *Yes, there a lot of water wastin', and there are places that need that water.*
- *It is, it is. I agree.*

- *There isn't any sense in being selfish.*

- *Yes, we have too much to not want to share it.*

While others felt Dominicans should benefit or be compensated for all water exportation:

- *It's commonly accepted because it creates employment.*

- *We should use* [sell] *it commercially.*

- *It a way of income to the country.*

- *To promote the water is very good because you could get to know about the island and what the island is made of, and people could come to visit.*

- *Your water bill comes here and you pay it. Why should you share water with somebody else? If a disaster happens or something comes up we can help them. But privately, I don't think someone will give you the full opportunity to make money.*

❖ When asked, *If the resource is shared, in what ways should it be shared?,* 28 respondents provided many suggestions. This was posed as an open-ended question, so some interviewees provided more than one response. The most common response was that Dominican water should be bottled in country and then exported. The table below demonstrates the different modes of exportation that the respondents mentioned and the number of times each response was given[5] (Table 4.22).

[5] Four interviewees chose not to respond and two people unsure what the best method would be when asked, *If the resource is shared, in what ways should it be shared*?

Table 4.22 Methods of Exporting Water

Response	Response Count
Bottled in country	18
Tanker ships (in bulk)	9
Cruise ships	7
Bottled other forms (beer, sulfur for medicine, etc.)	2
As many ways as possible	1
Public stand pipe	1
Total	38

No response patterns were detected through stratification by gender, residence, or age. The following quotes demonstrate some of the reasoning behind the suggested methods of water exportation by the respondents. Most of the responses included more than one method of exportation:

- *We have all different brands making bottled water locally here. I think we should export it.*
- *Bottled water. That way you promote the country as well.*
- *Cruise ships and bottled water.*
- *It's normally exported by bottles, but I think if it could be exported by cruise ship or in many different ways so anybody could get to know about the island.*
- *It should be shared by bottle and for the cruise ships.*
- *Well, we in Dominica, we used to be dependent on the banana sales, and now it's more of the tourism thing, and whenever there's a cruise ship in there's a demand for freshwater, and that we do also. We make sure that there is clean freshwater for the cruise ship available. We also export water in packages, like boxes or bottles, also the tankers and bags going out.*
- *I think they have a company in Dominica making water* [bottling water]. *I know a guy that is working in that company. That would be good.*
- *It's shared already [in country] with the public standpipe. And we have an abundance of water and we have the bottles we should export. Long ago, we had those tankers come in from Aruba and Caruso. I think we should do that. We supply to the cruise ship already.*

- *I haven't really thought about that to tell you the truth. If I have to think about it now, I don't think the cruise ships. Definitely not. It's pretty much like this. A lot of people come to the island, right? They come here, they try the local beer, and when you have variety, you have choices, you can pick out what you want, a lot of people don't really, they might not go for what we have already, because the cruise line's already well-established with, you know, loads of different brands of water or whatever it may be. It would make any sense. And the brands that the tourists know in their countries they think are better than what we have in the third world. They think it's safer. I think to the islands that need the water. They know we have good water. That would be a better market. That would makes us sell a not more, and not only that, but it would be… it's still a generous thing to do.*

- *It should be exported in as many ways as possible.*

- *I would say big ships of water.*

- *Ship tankers and bottled water.*

- *Sometimes bottles, and containers, and the big tanker.*

❖ Knowledge of foreign companies extracting Dominican water is not common on the island. When asked, *Have you heard that the government is selling water in bulk to foreign companies who sell it elsewhere?*, most of the interviewees were not aware of foreign companies purchasing or leasing water or access to water. Six respondents did have knowledge of foreign sales. The table below demonstrates the 29 responses[6] (Table 4.23).

Table 4.23 Knowledge of Foreign Water Sales

Response	Response Count
No	20
Yes	6
Total	26

The majority of both men and the women interviewees had no knowledge of the Dominican government making water sales agreements with foreign companies (Table 4.24). Although it is commonly known that water is exported from Dominica, respondents have a very limited knowledge of current government agreements. Several respondents

[6] Three Interviewees chose not to respond to this question and three interviewees were unsure when asked, *Have you heard that the government is selling water in bulk to foreign companies who sell it elsewhere?*

mentioned that the government was not very transparent with their endeavors, and this could explain why the majority of men and women were not familiar with the role foreign companies' play in water exportation.

Table 4.24 Differences in Response by Gender

	No	Yes	Total
Male	14 (82%)	3 (18%)	17 (100%)
Female	7 (78%)	2 (22%)	9 (100%)
Total	21 (81%)	5 (19%)	26 (100%)

Table 4.25 demonstrates that most of the urban and rural populations had no knowledge of the Dominican government making water sales agreements with foreign companies. Of the respondents that were aware that foreign companies have leases to export water, most live in urban areas. Government headquarters and DOWASCO are in the capital, Roseau. Urban residents may have a better awareness or hear more gossip of government endeavors in foreign exchange than rural residents.

Table 4.25 Differences in Response by Community Type

	No	Yes	Total
Urban	10 (77%)	3 (23%)	13 (100%)
Rural	11 (85%)	2 (15%)	13 (100%)
Total	21 (81%)	5 (19%)	26 (100%)

Table 4.26 indicates that the majority of the respondents between the ages of 18 and 50 and the respondents 50 years of age or older had no knowledge of the Dominican government making water sales agreements with foreign companies. However, a greater number of respondents 50 or older than those respondents younger than 50 years old were aware of contracts between the Dominican government and foreign companies to extract water. An explanation for this distinction could be that older generations may prioritize following politics more than younger generations do.

Table 4.26 Differences in Response by Age

	No	Yes	Total
18-50	15 (88%)	2 (12%)	17 (100%)
50+	6 (67%)	3 (33%)	9 (100%)
Total	21 (81%)	5 (19%)	26 (100%)

For this data set, age seems to impact Dominican perspectives. More respondents ages 50 or older had knowledge of the Dominican government making water sales agreements with foreign companies than the younger respondents. Similarly, urban residents were slightly more aware of foreign contracts than rural residents. Gender stratification was not associated with sample responses.

The following quotes demonstrate how most respondents had not heard of any business arrangements for water extraction between the Dominican government and foreign companies:

- *No, no.*
- *No, I haven't heard of that.*
- *I don't know. It could be, but I don't know.*
- *I think so, you know. I think it's a good idea. Our country will benefit from it financially and it's always good to share your resources.*
- *No, no, no.*
- *Not that I am really sure of, but there might be some talk, but I'm not privy.*
- *I think not on water no, we import water you know. Most thing in Dominica we import. We have all these stuff in Dominica to export and the government is so messed up. He seein' only for his self so he can have. We have all that water, bananas, citrus we could export, we need to have a factory or industry or something, then we can export. Maybe do two industry, like a juice industry and maybe have a water industry. Each industry you could have 600 workers, you see, that is 600 people that is workin' already. Them men they only for themselves. Selling a passport for $250,000. You never heard that in Dominica? Chinese got passport. But Dominica got water. So the things is politics.*
- *So far, there are just local bottle companies.*

Some respondents were not sure:

- *The government gives no insight to what happens. They keep the information for themselves.*
- *Well, that was said but it was politics related so I'm not sure to believe it or not.*

Others had some knowledge of international exportation:

- *I can't remember the name of the company, but yes. There is one that exports to St. Lucia and Antigua.*

- *That was long ago, but it hasn't come into effect. There was some bulk water thing, but it didn't come into effect.*

- *Yes, I think it's a good idea. The country will benefit financially and it's always good to share your resources.*

- *Yes, the Chinese export the water.*

In 2013, I met with the Chief Engineer of Dominica Water and Sewage Company Limited (DOWASCO). According to him, DOWASCO is responsible for providing water to the citizens of Dominica. Currently, 95% of Dominicans have access to clean water. It is DOWASCO's goal to provide clean water to 100% of the island in the next three years. Currently, DOWASCO does not export water, but they plan too. In 2007, Hurricane Dean damaged a large portion of the infrastructure, so in order for exportation to occur, DOWASCO needs:

- New infrastructure (pipes, sanitation stations, etc.)
- Solid foreign investors
- Improvement of water quality (environmental and health concerns presently)

Figure 4.3 One of Dominica's Hydroelectric Stations (Dominica Organic Agriculture Movement)

DOWASCO intends to sell bulk water. The long-term goal is to promote Dominica and sell water in bulk for profit. There were issues with water quality because of the pipes and treatment system, so the planned has been on hold since the early 2000s. In the

meantime, DOWASCO is looking for other investors and alternative ways to improve the system. This pipeline connections three Dominica Electricity Services Limited (DOMLEC) hydropower stations (Figure 4.3),

> "The water originates at the Freshwater Lake and flows to the first power station located at Laudat. Water then flows to the second station located at Trafalgar, and finally flows to the third station at Padu. The outflow then goes to a holding tank, which is the starting point of DOWASCO's bulk water System" –Personal Communication with M. Williams (2013).

There is a plan for DOMLEC to construct more hydropower stations on the island, and they are currently exploring financial opportunities. During 2010-2011, the islands surrounding Dominica experienced a drought. DOWASCO aimed to sell Dominican water to those governments, but there was a lack of organization in the government-to-government conversation. Similarly, those governments were disinterested in depending on another nation. DOWASCO has built a relationship with Sisserou Water Inc. A license has been granted to the company to export 3 billion gallons per year from the Sisserou River in the northern part of the island. Sisserou Water Inc.'s requirements for this license include (Savarin 2009):

- Employment generation
- Job creation
- Expansion of our export base
- Generation of foreign exchange earning
- Creating training prospects for nationals
- Improvement in the social and economic climate of the local community and our country as a whole

Though the license has been approved, there is a need for further foreign investment for the project to reach in intended potential.

❖ When asked, *Have you heard that the government is selling or giving water to the cruise ships to entice them to come to Dominica?*, most people were aware of the transaction (Table 4.27). The table below demonstrates how each of the interviewees responded[7].

[7] Two interviewees preferred not to respond, and two stated that they were unsure When asked, *Have you heard that the government is selling or giving water to the cruise ships to entice them to come to Dominica?*

Table 4.27 Knowledge of Cruise Ship Access to Water

Response	Response Count
Yes	17
No	11
Total	28

Table 4.28 indicates that gender is associated with the knowledge respondents have of Dominican water arrangements with cruise ships. The majority of men were aware of the Dominican government making water agreements with cruise ships, whereas, most women had no knowledge of this form of bulk water exportation. Overall, more men and women were aware that cruise ships do have access to Dominican water than not.

Table 4.28 Differences in Response by Gender

	Yes	No	Total
Male	13 (68%)	6 (32%)	19 (100%)
Female	4 (44%)	5 (56%)	9 (100%)
Total	17 (61%)	11(39%)	28 (100%)

The residency of participants was not associated with any response patterns. Table 4.29 not only shows that most respondents were generally aware of cruise ships accessing Dominican water, but also demonstrates that most of the urban residents and the rural residents were aware of the Dominican government making water agreements with cruise ships.

Table 4.29 Differences in Response by Community Type

	Yes	No	Total
Urban	9 (64%)	5 (36%)	14 (100%)
Rural	8 (57%)	6 (43%)	14 (100%)
Total	17 (61%)	11(39%)	28 (100%)

Sample stratification based on the age categories did not create any interesting response patterns. Table 4.30 illustrates how most of respondents between the ages of 18 and 50 and the respondents 50 years of age or old were aware of the Dominican government making water agreements with cruise ships.

Table 4.30 Differences in Response by Age

	Yes	No	Total
18-50	11(65%)	6 (35%)	17 (100%)
50+	6 (55%)	5 (45%)	11 (100%)
Total	17 (61%)	11(39%)	28 (100%)

The cruise ship industry is very prevalent in Dominican culture. Stratifying the sample population did not generate any significant patterns in this specific data set. Gender had a slight influence over awareness; however, age and community membership had no effect on knowledge of water agreements with cruise ships. These data indicate a generalized Dominican awareness among the respondents of that transaction.

The statements below share some of the knowledge and perspectives of Dominican respondents regarding the government is selling or giving water to the cruise ships to entice them to come to Dominica.

Many respondents were familiar with cruise lines utilizing Dominican water:

- *We supply the cruise ships with water. It's excellent. It brings more revenue.*
- *I know about that. It is good.*
- *Yeah, they always givin' them water. It's good. Tourism is like the main export on the island.*
- *It's a good idea, they like our water, of course.*
- *I think they sell it to them.*
- *I heard that in local gossip. I heard something like that from a guy, a colleague of mine; he was saying something like that not too long ago. Very recent. It wouldn't be a problem. It's not the best way or it shouldn't be the primary way to export our water or market our water, because there is like a limitation. The cruise ships only going to be there, for what, maybe a day and that's it. What's the quantity, what's the amount of water you can actually give them, you know? I just see it as a way of showing good hospitality to the tourists and that's it.*
- *For them, water is free. Plug your hose* [in] *and you have water.*
- *Yes, they do. It's very good because some of the feedbacks we have had is that in the Caribbean, or in the world, we have some of the* [most] *natural water. Fresh water its drinkable.*
- *Yeah man, when they come to Dominica the tourists buy the small bottle. I don't know about the ship. When the ship come you can see the engineers working and them paintin', but you never know what they really*

doing. I bet they have everything they need already on that boat. It's like a land you know so when they come to dock I don't really know if they really buy stuff, if they really buy that [water] *in Dominica. They have everything on the boat. I suspect they have drinks, liquor…*

- *We export water to the cruise ships. When the cruise ship come it hooks up and takes the water. That's a good move. They know the quality of or water and that can make a bigger market for us.*

- *I know they get it. Its good if we got the water exporting to other places.*

Others were not aware of the cruise ships accessing Dominican water:

- *Not that I know of.*

❖ When asked, *Are the water sales mainly motivated by moral obligation or a way to bring money to Dominica?,* the respondents provided insight to what they felt the key incentive for the country to export water was, and it different greatly from their individual perspectives. The table below illustrates the thoughts of 29 respondents[8] (Table 3.31). There was not a response that outnumbered the others; therefore, the most common responses for the primary motivation to export water were a combination of moral and economic reason or economic reasons alone. Although the majority of respondents felt a personal moral responsibility, only one respondent felt that morality is the main motivation for the Dominica government to export water.

Table 4.31 Primary Motivations to Export

Response	Response Count
Both, moral and economic	14
Economic	14
Moral	1
Total	29

Gender stratification did demonstrate a distinct response patterns. Table 4.32 illustrates that the majority of male respondents felt economic opportunity alone was the primary motivation for Dominica to export water. Most of the women interviewed thought water exportation was equally motivated by morality and economic opportunity. Men and women have different perspectives on why water is currently being exported from Dominica.

[8] Two people chose not to answer this question, and one was unsure when asked, *Are the water sales mainly motivated by moral obligation or a way to bring money to Dominica?*

Table 4.32 Differences in Response by Gender

	Both	Economic	Moral	Total
Male	7 (37%)	11 (58%)	1 (5%)	19 (100%)
Female	7 (70%)	3 (30%)	0 (0%)	10 (100%)
Total	14 (48%)	14 (48%)	1 (4%)	29 (100%)

Sampling for residency did reveal a response pattern. Table 4.33 demonstrates that most of the urban residents thought economic opportunity was the primary motivator, and that the majority of the rural residents thought water exportation was equally motivated by morality and economic opportunity. From these data, urban and rural residents do not share a common perspective of why Dominica exports bulk water, despite how they feel as individuals.

Table 4.33 Differences in Response by Community Type

	Both	Economic	Moral	Total
Urban	4 (29%)	9 (64%)	1 (7%)	14 (100%)
Rural	10 (67%)	5 (33%)	0 (0%)	15 (100%)
Total	14 (48%)	14 (48%)	1 (4%)	29 (100%)

According to Table 4.34, most of the respondents between the ages of 18 and 50 thought water exportation was equally motivated by morality and economic opportunity; whereas half of the population with 50 years of age claimed economic opportunity was the primary motivator for water exportation. Slightly more respondents between 18 and 50 maintain that water is exported for both moral and economic reason. In contrast, slightly more respondents 50 years of age or older stated that water is primarily exported for economic reason. That being said, all responses in this stratification are very close and a larger sample would potentially provide clearer distinctions.

Table 4.34 Differences in Response by Age

	Both	Economic	Moral	Total
18-50	9 (53%)	8 (47%)	0 (0%)	17 (100%)
50+	5 (42%)	6 (50%)	1 (8%)	12 (100%)
Total	14 (48%)	14 (48%)	1 (4%)	29 (100%)

For this data set, gender and community seem to impact perspectives. More women than men felt ethical obligations and economic opportunity influenced exportation motivation. Men generally felt potential income was the key motivation to export. Similarly, more rural respondents than urban respondents felt moral responsibility and potential income equally influenced exportation, whereas, urban respondents more frequently stated that economic opportunity was the primary motivation. Age displayed slight distinctions, but was generally split between the two most common responses: moral and economic motivations as a combination and economic motivations alone.

The statements below share some of the opinions and perspectives of Dominican people regarding the main motivation of exporting water.
Though the respondents individually felt a moral responsibility to share water, many felt the main motivation for the country to export water is based on economic potential:

- *We like to keep our island natural, so if it wasn't commercial* [making a profit] *we wouldn't just give it away.*
- *It's mainly motivated by money.*
- *We need foreign exchange so we have to do it. That* [water] *is our main resource, natural resource.*
- *Water is a big way to bring money to Dominica.* T*here is never a shortage of water, so I think we should use it*.
- *I think it's mainly economic.*
- *Money man, money baby. Anything you export is money. But trust me, money is the first priority. That is why they export. The quality of the water is what people want.*
- *Just for economic.*
- *For economic reason, to help with disaster* [in other places]*. These are very good reasons.*
- *Its money. There is no morals in profit.*
- *It's a proper economy for Dominica.*
- *For me it's economic. If we exportin' water we must be gettin' something.*

The same amount of respondents in the sample population claimed that economic benefits alone motivated water exports as those who stated that moral and economic value were equal incentives in the process:

- *I would say maybe both, economic and share with people that don't have it.*
- *Well it's a win-win situation eh? Looking at it. Give you water, I get income for my country same way I provide others with none.*

- *I can say both.*

- *It could be a bunch of different ones. If I had to pick* [the main motivation] *right now I would say…. I think we have too much water. If I have to really put it to thought we have an overabundance. It's really similar to the situation with the mountains that we have where they have all those quarries now and they exporting the sand you know and all that stuff. To make blocks and other stuff. It's very similar.*

- *Maybe to share with others who haven't got, and then to get some finances out of it also.*

- *Both, it's for both.*

4.2.3 Evidence of Climate Change in Dominica

❖ Individual experiences of changing weather were common among the sample. When asked, *Has the seasonal weather changed over the past years?*, the responses were overwhelmingly, yes. Twenty-nine out of 32 interviewees described changes in weather they have experienced, while three respondents did not believe Dominica has faced any climatic shifts. Table 4.35 illustrates the responses.

Table 4.35 Experiences of Seasonal Weather Changes

Response	Response Count
Yes	29
No	3
Total	32

Gender demonstrated little to no association with observations of weather changes. The majority of male and female respondents had experienced changes in seasons or climate (Table 4.36). Weather does not affect men and women differently, so this result does not come as a surprise.

Table 4.36 Differences in Response by Gender

	Yes	No	Total
Male	19 (95%)	1 (5%)	20 (100%)
Female	10 (83%)	2 (17%)	12 (100%)
Total	29 (91%)	3 (9%)	32 (100%)

Rural and urban residents do not experience shifts in seasonal weather differently. Table 4.37 indicates that most of the urban residents interviewed and all of rural residents interviewed had experienced changes in seasons or climate. It is

interesting to note that every rural respondent indicated that they had observed distinct changes to Dominica's normal weather patterns.

Table 4.37 Differences in Response by Community Type

	Yes	No	Total
Urban	13 (81%)	3 (19%)	16 (100%)
Rural	16 (100%)	0 (0%)	16 (100%)
Total	29 (91%)	3 (9%)	32 (100%)

Regardless of age, respondents observed recent changes in Dominican weather. Table 4.38 demonstrates that the majority of the respondents between the ages of 18 and 50 and the respondents that were 50 and older had experienced changes in seasons or climate. Although older generations have experienced more seasons, the most of younger respondents also observed shifts in weather patterns recently.

Table 4.38 Differences in Response by Age

	Yes	No	Total
18-50	17 (89%)	2 (11%)	19 (100%)
50+	12 (92%)	1 (8%)	13 (100%)
Total	29 (91%)	3 (9%)	32 (100%)

For this data set, community membership seems to impact perspectives. Every respondent from a rural community indicated that they had noticed or heard gossip of weather or environmental changes on Dominica. Gender and age were not significant for these data.

Below are a series of quotes describing the ways in which seasonal weather patterns have changed.

- *In terms of climate not really, but we been getting a lot of rain. The temperature remains the same. We only have two seasons here, a dry season and a rainy season. The rainy seasons from June to November. Six months. The dry is from November to June. There is more rain in the rainy season.*

- *No it's not the same. Now it's like we get more sun.*

- *Climate has changed so it's different. It's like we get less summer and more cold from October/November when it was December and goes all the way to January/February. This January was hot though and normally in January its cold.*

- *Rainfall is not the same. The rainy season is shorter. Hurricane season used to be from May to November, and now you only get hurricane sometimes in August/ September, but we do get more storms.*

- *Basically the way it has changed is with the deforestation. The times we used to have the rainy weather, it's a mix up all together, like a certain time or a certain season, we used to say okay that's the rainy season and that's the dry season, but now it's not like that. It's at the wrong times.*

- *No, it's always changin'. In Dominica we got a hurricane season. The hurricane season normally starts from June to November. Always rain, bad sea, bad weather. The other months is like sun, sun, sun, Its different now, like for the past two years, in the sunny seasons its always raining, so you can't tell whether its rainy season or sunny season. It's changed a lot. The sunny season and the rainy season just merged.*

- *Everything is different. In the dry season we get a lot of rain. It depends on the year, El Niño or whatever, but this year was pretty good, we got a good amount of rain.*

- *Yeah, definitely. We are in the tropics, but there are certain times when it's not even Christmas season where we expectin' to get like maybe a cold front or something like that and then all of a sudden, you know, it could just be very, very chill, like in the very early mornin' in the very early hours, getting ready to go to work and anything like that and you would just see cars and windows frosty, and you're like, what?*

- *I would say it does rain awkwardly here. I would say a lot of people wouldn't normally notice because, Dominica, the annual rainfall here is sometimes over 300 inches of rain, and even though it's not the rainy season we could get a lot of rain during the dry season. So I don't think a lot of people here would notice. There have been a few changes, a lot of stuff happenin', especially with the ocean. The Caribbean side would just get a lot of, I don't know where they comin' from, a lot of waves like we have a tropical storm warning or something, and then it's like a normal day. It's very unpredictable, and it's just like an all-around thing right now. Not only the rain, but you can actually see different changes in like, all the water and everything. Sometimes it's cold, sometimes it's extremely humid.*

- *It's getting hotter and hotter by the day.*

- *No it changin'. Because this the first we had that amount of rain in December. December we had a lot of rain. It's not really dry* [then, usually] *but it was extra that year, last year in December. It was windy too, and kind of cold around January/February.*

- *Yeah at Christmas time* [last year] *we had strange weather. How do you call, a trough? A lot of rain, there was a lot of flooding. The storms was bad in the hurricane season two years ago in September.*

- *Sometimes cool, sometimes hot. It's irregular now. But there is always rain in Dominica because of the mountains.*

- *Yes it has. The weather pattern has changed drastically, yes. Sometimes when we expecting a rain, we don't get rain at all, and when we expecting sun it's like a whole river cycle. During the summer when it's supposed to be sunny, sometimes we get a lot of rain. It has been, climate, climate has changed.*

- *We got plenty of the climate changes. Sometimes in the hot season we don't expect rain and we getting rain. And sometimes now the rainy season is a hot time too, so climate change.*

- *We expect to have our seasons* [dry to rainy] *change in June and now they don't. Everything is changing, and what everyone experienced in Christmas Eve* [severe rain, flooding, power outages]*, you can see that things are really changing because we never got those kinds of things before around Christmas time. The timing of the season are different. When we do expect the rain we get none, only when we don't expect rain we get rain.*

❖ Although the majority of interviewees have experienced changes in recent weather, drought has not been a climatic change that many of the Dominican respondents noted. When asked, *Do you believe that there have been drought years recently?*; only seven people said that they had observed lower water availability. The following table indicates how the 31 interviewees responded[9] (Table 4.39).

[9] One respondent was unsure when asked; *do you believe that there have been drought years recently?*

Table 4.39 Drought Experience

Response	Response Count
No	20
Yes	7
Even when there is little rainfall, there is still never a drought	4
Total	31

Stratifying the respondents by gender did not reveal noticeable variation. Table 4.40 shows that most of the men and women who participated in this study had never heard of Dominica having a drought. Men and women generally perceive Dominica's abundance of water in the same way.

Table 4.40 Differences in Response by Gender

	No	Yes	Even With Less Rainfall, There is No Drought	Total
Male	12 (60%)	5 (25%)	3 (15%)	20 (100%)
Female	8 (73%)	2 (18%)	1 (9%)	11 (100%)
Total	20 (64%)	7 (23%)	4 (13%)	31 (100%)

The residence of participants does demonstrate a slight response pattern. Table 4.41 indicates that the majority of the urban and rural residents interviewed had never heard of or experienced drought in Dominica. Urban residents, however, more frequently said that they were aware of droughts in Dominica's past than rural respondents. In contrast, rural respondents made the distinction more frequently than urban respondents that even when Dominica experiences a decreased level of rainfall the island does not experience drought.

Table 4.41 Differences in Response by Community Type

	No	Yes	Even With Less Rainfall, There is No Drought	Total
Urban	9 (60%)	5 (33%)	1 (7%)	15 (100%)
Rural	11 (69%)	2 (12%)	3 (19%)	16 (100%)
Total	20 (64%)	7 (23%)	4 (13%)	31 (100%)

Age was not strongly associated with respondent experiences of drought. Table 4.42 displays that the majority of respondents between the ages of 18 and 50 and respondents who were 50 years of age or older had never heard mention of, or personally experienced, drought in Dominica. Similar percentages of respondents from both urban and rural communities had experienced drought. More respondents between 18 and 50 suggested that decreased rainfall does not cause drought on the island than people 50 or older. Perhaps, younger generations are more confident in water stability on Dominica or did not personally experience past droughts.

Table 4.42 Differences in Response by Age

	No	Yes	Even With Less Rainfall, There is No Drought	Total
18-50	11 (61%)	4 (22%)	3 (17%)	18 (100%)
50+	9 (69%)	3 (23%)	1 (8%)	13 (100%)
Total	20 (64%)	7 (23%)	4 (13%)	31 (100%)

Though many Dominicans had comments regarding weather pattern change or climate change, most had not heard of or experienced drought on the island. Stratifying the sample population did not generate any statistically significant analyses, but distinct patterns can be observed. Residence and age could be associated with knowledge of changes in weather, particularly in regards to drought. Gender had no influence on knowledge of Dominica experiencing drought. Many, if not most, of the respondents interpreted this question in terms of agriculture (crops being affected by less rainfall); therefore, it is reasonable that rural respondents would have more experience with drought on Dominica. However, these data indicate that drought experience is rare.

The following statements are some of the responses that were provided.

Most respondents had never experienced or heard of Dominican droughts:

- *Never, not on this island. Maybe the other islands, but I don't know.*
- *Water is always available. No drought.*
- *There is the same amount of rain. No drought.*
- *No, I would say more rain. Like in the sunny season there has been a lot of ran lately.*
- *Even when there is a drought for us, we still have water. Not like Grenada. We can't complain.*
- *Drought?* [laughs] *No, never.*

Some respondents expressed the concerns about the resource decreasing or their experiences with past drought in Dominica:

- *People are talking about we have a lot of water in abundance and stuff, but there are a lot of areas that had water before, and right now we actually not seein' it, because it's like thinning out. For example, like I was mentioning about that same type of sulfur water, the one that I said people drink as a cleanser, before it used to be like a larger stream of*

water going down there. Now it's very, very small, it's not as powerful, it doesn't flow as much. Only when there's heavy rainfall, that's when it gets to flow that much. So I see there is a little bit, kind like a decline, in our water also. I don't know what's the cause of it.

- *A few years ago, if you were snorkeling in Dominica, especially like in Soufriere, there's a certain area we call l'abîme, which is French for the abyss, before that area we used to have a lot of coral life, the reef was very colorful, I would see a lot of sea ferns there and a lot of stuff, but it shortly started dying off. Now we have one of the streams from the sulfur deposit flowing right down and when the current is going down towards the north to the northern side of the island, it carries the water all the way down there and it goes straight onto the reef, and those areas have been affected. It could be also because of a lot of garbage in the side of the little stream, but I can see the effects of less freshwater. The whole thing* [ecosystem] *is affected. Before we used to have areas right there on the shoreline where you could just throw a line right there, not even in three feet of water, and you could catch a huge fish, going about 10 pounds or whatever, those days, there not happening anymore where you could set a net and get a whole boat load of fish, there not really happening. It happens right now like once in a blue moon, and before it could be a regular thing where a lot of fish were like in the marine reserve, especially very near the shoreline.*

- *Oh yeah, it was recent. It didn't only affect Dominica. About three years ago, it was not one year ago. St. Lucia was affect that same time, the neighboring islands. That wasn't normal. If I can recall properly, it lasted for like, maybe, months where everything was dry everywhere, and Dominica is normally lush scenery. It was hard especially for the farmers. A lot of crops that needed a sufficient amount of rain, they were not getting' any, and it was very hard for them during that time. All the crops suffered, everything, the bananas for export and the local foods. During that time also, that's when it was extremely humid, like every day. That was the first time when passing around you could hear people gossiping and talking about global warming. That was the first time people were talking about that stuff. Now it* [local talk about climate change] *stopped because everything is back to normal pretty much.*

- *Well, I mean three years ago… but it wasn't really a drought. Rain wasn't really falling as frequently as it would, and they said that we probably could be going to a drought. It lasted for like a month, or less than that, and then it ended. It wasn't really serious.*

- *We have had some droughts, not long ones, but we have had some droughts. The last two years we had a bad one, yes. Rain was low. No rainfall. Maybe 2012… Most of the year it was really dry. Farmers were, it was really hard on the farmers.*

❖ When asked, *What would Dominica be like if there were less water on the island?*, many of the respondents had a hard time even imagining such a place. Others described serious cultural impacts, while some envisioned chaos. The following quotes provide some insight into what the island might be like if water were less abundant.

Many respondents imagined potential difficulties if water availability were to decrease:

- *Man. It would be like not havin' your parents around because you known them your entire life. It would definitely affect us in a major way, because from since I known myself as like a little, little boy water has been like everywhere flowin' freely. You would just like go and dig up somewhere and out of the blue you just see some water just right there. You won't even notice walking on top of it on a paved road, or just if something happened to that road you would just see water. So it's pretty much just everywhere so we just, we gotten accustomed to it and without it I don't think… it would never be the same. It would never be the same.*

- [It would be] *difficult. Water plays a huge part you know. 40% of electricity comes from hydro.*

- *I would imagine it to be like a dead zone. Because water is life. You need water to survive.*

- *It would be doom. The alternative would be the sea. We use rainwater for everything. Up north they have the river*[s], *so they would never have a problem.*

- *No water? Some people would be miserable. Because, on a hot day we go to the river to take a bath* [swim] *and no river we couldn't do that.*

- [Laughs] *I don't know. I wouldn't be able to do without it. I kind of… I wouldn't say waste it… but [laughs] I don't think I would be able to do without it.*

- *We call the island nature island of the Caribbean. It's built on rainforest and water, so it's* [the importance of water] *huge.*

- *Well it would be very tough on the people. Very, very tough. Because, of the bananas. A scarcity of water you know would put a burden on the farmers.*

- *Especially in communities that have no rivers, it would be too much, how do you say, problem to go to another community to get water. A lot of difficulty to get water if there* [was less].

- *Our rivers would dry up. We would have no river. We would be usin' the seawater. Maybe it would affect our Boilin' Lake, which is the* [second] *largest boiling lake in the world.*

While other respondents had either never considered or do not considered it a possibility:

- *I haven't thought of that.*

- *Well I guess we used to it…. We so used to havin' so much water. Dominica has water overflowin'. We have so many rivers it's not possible.*

- *Can't even imagine* [what life would be like is there was less water here].

- *I don't think we would have that problem ya. It could happen you know because God's will can happen anytime, but Dominicans go by the volcanoes and stuff so they can get water. I don't think we'll have a problem too much. Because you have people that's livin' on the rivers, and they build and there's rivers all around. So they have water in a flash you understand? So I'm not sure, not sure how it will be, but if it do happen, it will be chaos because livin' without water… water is life, you understand? You cannot live without water. You use water for every maintenance; everything you can do in life is* [with] *water. So that is why they say water is life. What you say there, I think it will be chaos. Engine use it. People use it. If there is only one fountain and a thousand people to use it you see that chaos. If it do happen that's chaos.*

- *We will never have less water.*

❖ The Dominican respondents demonstrated an understanding and support for sustainable resource management as the climate changes. When asked, *If there are increasing drought years should this influence whether or not Dominican water should be sold to foreign companies?*, 18 respondents indicated that Dominica should cease water exports. Nine interviewees maintained that the island should continue exporting the resource. Because this was posed as an open-ended question, some of the

responses were a little more complex. One respondent stated that the resource should be monitored before any decisions to stop exporting were made. Another felt the resource should be conserved, but could still be exported in smaller quantities. The following table quantifies these responses[10] (Table 4.43).

Table 4.43 In the Case of Drought, Should Water Exports Continue?

Response	Response Count
Stop exporting	19
Continue exporting	9
Other	3
Total	31

Gender was not was associated with the concept of conservation. Table 4.44 shows that most men and women in this study said Dominica should cease water exportation in the case of water levels decreasing. However, it is not surprising that a few men and women maintained that exports should continue, since the majority of the respondents had never heard of or experienced drought on the island.

Table 4.44 Differences in Response by Gender

	Stop Exporting	Continue Exporting	Other	Total
Male	11 (58%)	6 (32%)	2 (10%)	19 (100%)
Female	8 (67%)	3 (25%)	1 (8%)	12 (100%)
Total	19 (61%)	9 (29%)	3 (10%)	31 (100%)

Respondent's residence revealed a slight pattern in the data. As seen in Table 4.45, the majority of the rural residents thought water exportation should stop if water levels in Dominica decreased. Half of the urban respondents supported sustainable management and conservation, but respond that exports should continue more frequently than rural respondents. Earlier it was established that rural people have more water knowledge than urban residents, so rural people may share a greater concern of a decrease in the resources availability based on their stronger dependence on a broader variety of water.

[10] One respondent was unsure as of what to do in this scenario when asked, *If there are increasing drought years should this influence whether or not Dominican water should be sold to foreign companies?*

Table 4.45 Differences in Response by Community Type

	Stop Exporting	Continue Exporting	Other	Total
Urban	8 (50%)	6 (38%)	2 (12%)	16 (100%)
Rural	11 (73%)	3 (20%)	1 (7%)	15 (100%)
Total	19 (61%)	9 (29%)	3 (10%)	31 (100%)

Age does seem to have a slight association with the concept of sustainability. Table 4.46 demonstrates that most of respondents between the ages of 18 and 50 said Dominica should cease water exportation in the case of water levels decreasing. Half of all the respondents who were 50 or older supported water conservation. Sustainability is not a new idea, however younger generations may have had a stronger introduction to the impacts of climate change and how to attempt to mitigate them more recently in school.

Table 4.46 Differences in Response by Age

	Stop Exporting	Continue Exporting	Other	Total
18-50	13 (68%)	5 (26%)	1 (6%)	19 (100%)
50+	6 (50%)	4 (33%)	2 (17%)	12 (100%)
Total	19 (61%)	9 (29%)	3 (10%)	31 (100%)

For this data set, all three of the sample stratifications seemed to impact Dominican perspectives. More women than men noted that water exportation should stop in the case of decreased availability. More rural residents than urban residents noted that water exportation should stop in the case of decreased availability, and more respondents between the ages of 18 and 50 noted that water exportation should stop in the case of decreased availability than those 50 or older. These response patterns could stem from education and life experience.

Below are a series of statements made by respondents regarding water exportation if there were a drought in Dominica. Most respondents felt water exports should cease:

- *Yes, I think it should have a major influence. It is important.*
- *If there is a drought then we should keep it more domestically.*
- *Water is life. Even if it could make money people here need is first.*
- *No we would have to save the water we have.*
- *We need to preserve it. It's about time to preserve what we have.*

Some respondents thought adjustments could happen:

- *Leave it to take care of local people, and export it after* [the drought ends].

- *The first thing is to monitor the situation of global warming starting now. It's not like before. Not just water, but looking at a lot of resources. The national dish, 'mountain chicken' (frog), is not even on the menu* [anywhere, anymore]. *Now just crabs. October, our month of independence is when that was popular. Now you never hear frogs* [chirping]. *On holidays and recreation days everybody want to go in the ocean. If there is a continuing decrease in water supply, they should take more serious measures to protect* [the] *supply. We have Dive Fest in July to create awareness about marine resources.*

- *They should try to conserve it in that case.*

Others felt water exports could continue:

- *Still sell it. We have wasted water. People waste water, so it should be metered.*

- *I don't think a drought would influence that. We would still have enough water.*

- *It would still be* [good] *to export to bring in money, but on a controlled basis.*

- *Still sell water because there are still a lot of rivers even if there is less rainfall. It's not easy to dry out our water. It would be a miracle.*

- *Still good* [to export] *because it's a good gesture. The moral value of it to be like a good citizen or good neighbor.*

- *Still export it. We have a lot of water. You could still use the sea water and purify it to make fresh water.*

- *Keep a balance. That's when you're going to have a problem.*

4.3 Results of application of method; any unusual situations encountered.

In general, the methods applied during this study were successful. The demographics of the sample population and sample size provide an insight as to the

cultural meaning of water nationwide, what people know and how they feel about water exportation, and any experiences of climate change. Although the sample set was carefully stratified, many responses were consistent across the demographic categories. I was prepared to find more significant differences in the responses between stratified sample groups. Throughout the survey results, the most significant sample strata distinction was between rural and urban residents. The summary of findings is discussed in detail in Chapter Five. The design of the survey instrument (see appendix) allowed for project participants to speak freely in response to the guiding questions and related topics. The amount and nature of the questions on the survey were carefully designed to document an adequate understanding of the larger context, but the interview was not so long as to inconvenience the volunteer respondents.

A few unusual situations were encountered. It quickly became clear that it would be difficult to interview an equal number of men and women. It was part of the research design to only interview in public spaces, and it is less common for women than it is for men in Dominica to spend their free time on the streets. Another difficulty was that although people were willing to be interviewed, many did not feel comfortable being voice recorded. Special care was taken in note writing to alleviate this strain on data recording. Unfortunately, 2014 is an election year in Dominica, so some citizens were suspicious of my intentions and work; however, I thoughtfully explained who I was and why I was in country. After a more in-depth introduction, all respondents willingly participated in the study. The findings presented in this chapter were achieved through background research, in-country scoping, project design, and field preparation anticipated and mitigated many potential complications before they occurred. The difficulties that did take place did not have any serious impact on data collection or analysis.

Chapter Five- Discussion

Figure 5.1 Woodbridge Bay, Dominica

5.1-Brief Overview

This study has investigated the social construction of water on Dominica. The unique cultural understanding of the resource has influenced Dominican perspectives on bulk water exportation. Specific aims consisted of gaining an understanding of the complexities associated with water use by conducting background research, collecting interview data, and analyzing the information to compile a Dominican narrative.

The key objective of this study has been to understand Dominican perceptions of water availability and how the resource should be used or exported. Dominica does have an abundance of fresh water resources, and *water is life* for Dominican people (Figure 5.1). The current foreign exportation endeavors (cruise ships and natural disaster relief) of Dominican freshwater are common knowledge among the respondents, and participants in this study have notable knowledge of their environment, but that the

driving force of potential economic development is overshadowing potential social or ecological impacts. The primary focus of the study is to understand the social construction of water; however, a secondary point of interest is to investigate complexities of the relationship between environmental change and bulk water exportation.

The existing literature on the history of Dominica contributed in building the framework of understanding for this study. Online newspapers provide current progressions and discussions associated with water availability and uses. Supplemental literature on water issues and climate change helped to contextualize Dominican experiences within this study. Triangulating previous relevant research, literature, and experience with the data collected during this study allowed for the objectives and specific aims to be addressed and the hypotheses to be tested.

This study involves a total of 52 interviews (32 formal interviews and 20 informal interviews) with people who are knowledgeable about water resources types and uses, as well as shifts in their environment. This sample population not only provides strong data, but also mirrors applied ethnographic research, because, “in practice, anthropologists must often deal with very small samples of informants” (Romney et al. 1986: 323). Within the 32 formal interviews, respondents from each sample strata participated. Romney et al. developed a model to determine a confident sample size for ethnographic research, and “in familiar cultural domains the model produces good results from as few as four informants” (1986: 313). The methodological claims of Arnold (1970), Romney et al. (1986), and Handerwerker (1998) influenced the design of this study in the small sample numbers that were chosen and the way the sample was stratified. This framework tests any variance among the dimensions of the population while still achieving confidence in the data. The study documents that the information in question is likely shared amongst the larger population.

5.2- Summary of Findings

Interview responses revealed complex relationship between the respondents, water, and the environment. No statistical significance could be determined with this sample, but clear patterns between population categories are present.

- Respondents hold an epistemological position that their surplus is a blessing that they are morally obligated to share with a more arid world and as aid in the case of natural disaster. However, Dominicans also supported the perspective that exporting water to foreign countries or companies can economically benefit the citizens of the island.

- Respondents believe that the sale of water by the government to foreign businesses is an appropriate action by the government, who manages the natural water as a common property of the Dominican people.

- Respondents have an accurate understanding of water in their environment, but do not envision the possibility of major environmental change or drought.

- Respondents understand that global warming is causing climate change resulting in unpredictability of timing and amount of rainfall. Because a wide variety of water types are recognized by participants, decreasing or inconsistent rainfall were not seen as alarming.

The findings incorporate specific ethnographic insights about the cultural meaning(s) and uses of water, and how these epistemologies are similar or different among the demographic categories. Rural residents identified a greater range of water types than urban residents. When asked about gender distinctions of water uses, the most significant dissimilarities were between rural and urban residents, and male and female respondents. Men and women generally share household responsibilities, however in some families, it is more common for women to manage tasks like cooking, cleaning, or washing. Some occupations held primarily, if not completely, by men, like construction, agriculture, or fishing, signify that there is a gendered divide in water uses. Though social class was not part of the sample stratification, owning a vehicle in Dominica is a social signifier. Several respondents mentioned men use water to wash their vehicle, and in this sense, it is not only a gendered but also a class specific use of water.

The concept that there is a moral responsibility to share the island's abundance of water is commonly known throughout Dominican culture. Regardless of gender, age, and community membership Dominicans have heard that because there is an abundance of water on the island they have a moral responsibility to share it with countries that lack. When asked how the concept developed, more men identified regional or global drought as the primary reason than women. Similarly, more urban residents noted regional or global drought as the main motivator. Although every respondent agreed that Dominica has a moral responsibility to share water, more men felt the island should be compensated in some way than women. Similarly, more respondents between the ages of 18 and 50 noted compensation should occur than respondents 50 years of age or older. More respondents ages 50 or older had knowledge of the Dominican government making water sales agreements with foreign companies than the younger respondents. The cruise ship industry is strong in Dominican economy and culture, so it was widely known that cruise ships in port receive Dominican water. More women than men felt morality and economic opportunity influenced exportation motivation. Men generally felt potential income was the key motivation to export. Similarly, more rural respondents than urban respondents felt moral responsibility and potential income equally influenced exportation, whereas, urban respondents more frequently stated that economic opportunity was the primary motivation.

Every respondent from a rural community indicated that they had noticed or heard gossip of weather or environmental changes on Dominica, whereas some urban residents did not. Though many Dominicans had comments regarding weather or

climate change, most had not heard of or experienced drought on the island. More women noted that water exportation should stop in the case of decreased availability than men. More rural residents noted that water exportation should stop in the case of decreased availability than urban residents, and more respondents between the ages of 18 and 50 noted that water exportation should stop in the case of decreased availability than those 50 or older.

Water is central within Dominican culture. Some of the ways Dominican respondents use, perceive, and sustainably manage natural resources include:

- There are many different types of water in Dominica, and these cultural perceptions influence how water is used. For example, sulfur water has medicinal purposes and rainwater is sometimes used for drinking in rural communities.

- Participants from rural communities perceive and rely on a wider variety of water types than urban communities.

- In general, all respondents described the island as having an abundance of freshwater.

- These respondents feel morally responsible to share water with other countries that experience extreme poverty and/or natural disasters. However, most people also recognized the profitability of the resource for the nation. Very few interviewees responded that they were aware of water currently being exported, and of those that were aware, even fewer knew the specifics of how the water was leaving the island and where is was going.

- Respondents from younger generations or urban communities more frequently recognized the economic benefits of foreign water sales than moral responsibilities as the incentive for the government to export water.

- The majority of interviewees supported water exportation, but people were divided between the ethical and economic incentives.

- Rural interviewees responded more frequently than urban respondents that they have experienced environmental changes.

- When asked if Dominica was experiencing climate change, many interviewees were unsure. However, when asked more specifically about changes to their land and recent weather patterns, the majority of people interviewed described decreased annual rainfall, inconsistent and unpredictable rainy and dry season, and more severe hurricanes.

- Most interviewees felt that if there were a drought in the future, water should not be exported, and only a very few people responded that Dominica could ever be affected enough by water shortage that it would be something to raise concern.

When discussing notable environmental changes in Dominica, one respondent mentioned the disappearance of the Mountain chicken (*Leptodactylus fallax)* (Crother 1999: 185). Mountain chickens, or *Crapauds* as they are referred to in the local Creole, are large frogs (Rahaman 1997). According to this respondent, mountain chickens used to be widely available on the island, and were a traditional national dish prepared for special occasions and holidays. Now, they said, Mountain chicken is never on the menu and you no longer hear them chirping. Apparently, they taste similar to poultry, and were named for that reason (Khan 2011).

Indicator species and other aspects of phenology were not topics I had strategically probed for in the design of the survey instrument, but the unanticipated discussion of the Mountain chicken presents strong evidence for TEK and climate change, and could be pursued further. Phenology is, "the study of how the biological world times natural events" in relation to non-biological influences, such as precipitation, temperature, and sunlight, (National Wildlife Federation 2014). This field of study provides insight into environmental changes, because, "plants and animals have life cycle events that seemingly occur like clockwork every year" (National Wildlife Federation 2014). Phenologists commonly study frogs as indicator species of climate change, because "frogs and salamanders breed and their offspring go through metamorphosis" (National Wildlife Federation 2014). Mountain chickens are an indicator species of climate change because they once thrived throughout the Caribbean islands, but now only inhabit Dominica and Montserrat (Khan 2011). The large frog has not yet gone extinct, but is categorized as critically endangered (Khan 2011),

> This species occurs mostly on the western side of Dominica (there is a more limited population-possibly translocated or reintroduced-on the eastern side). Its range is now restricted on Dominica to around 25 km² and to about 20 km² on Montserrat. It is a relatively low-altitude species on Dominica, occurring from sea level up to (rarely) 400 m asl (Fa et al. 2014).

Mountain chickens are not only an indicator species of climatic changes in Dominica, but also shed light onto one of the ways in which island cultures can be impacted by environmental shifts. In future development of this research, phonological methodologies would be useful for a more in-depth investigation of what Dominicans know about their environment and how they relate to it. It will become increasingly important to understand how the population will be impacted by bulk water exportation and climate change.

5.3 Need for the Research

This is a relevant study. Water resources are in high demand globally, and Dominica has been recognized internationally for having high quality and quantity fresh water. Though there has been substantial previous research on the island, there has been a shortage of sociocultural studies. This project begins to document the deeply rooted connection between Dominicans and their fertile environment (Figure 5.2).

Figure 5.2 Pagau Bay, Dominica

5.3.1 Who Will Benefit

This study has the potential of benefitting the study population and society. The interview process and subsequent recorded findings will document existing local knowledge regarding water resource use in Dominica. This information is culturally significant, and also has educational benefits. The interview topics also have greater social significance, and could potentially benefit Dominicans at a larger magnitude and duration by expanding the information and discourse of understanding water use and exportation. The sample demographics of this study make the findings more generalizable to the population as a whole, because the data will collect responses from varying ages, residential areas, and sexes. Any patterns or commonalities in responses

of the 32 interviews provide confidence in the findings and understanding of the cultural meaning of water in Dominica.

5.3.2 Practical and Theoretical Implications

Findings from this study suggest that Dominicans are highly dependent on water, not only because it is a basic necessity of life, but also because of substantial cultural connections, and its role in energy production, agriculture, and tourism. Dominica runs on water.

This study, like others before it, recognizes the exceptional relationship Dominican people have with their environment (Figure 5.3). A new practical inference, however, is that Dominicans value moral integrity and charity in an equal esteem with money and development, but do not feel the government is driven by the same motivations. The findings have revealed unique characteristics of Dominican culture, as well as an ideology that can motivate or gain support from the Dominican population.

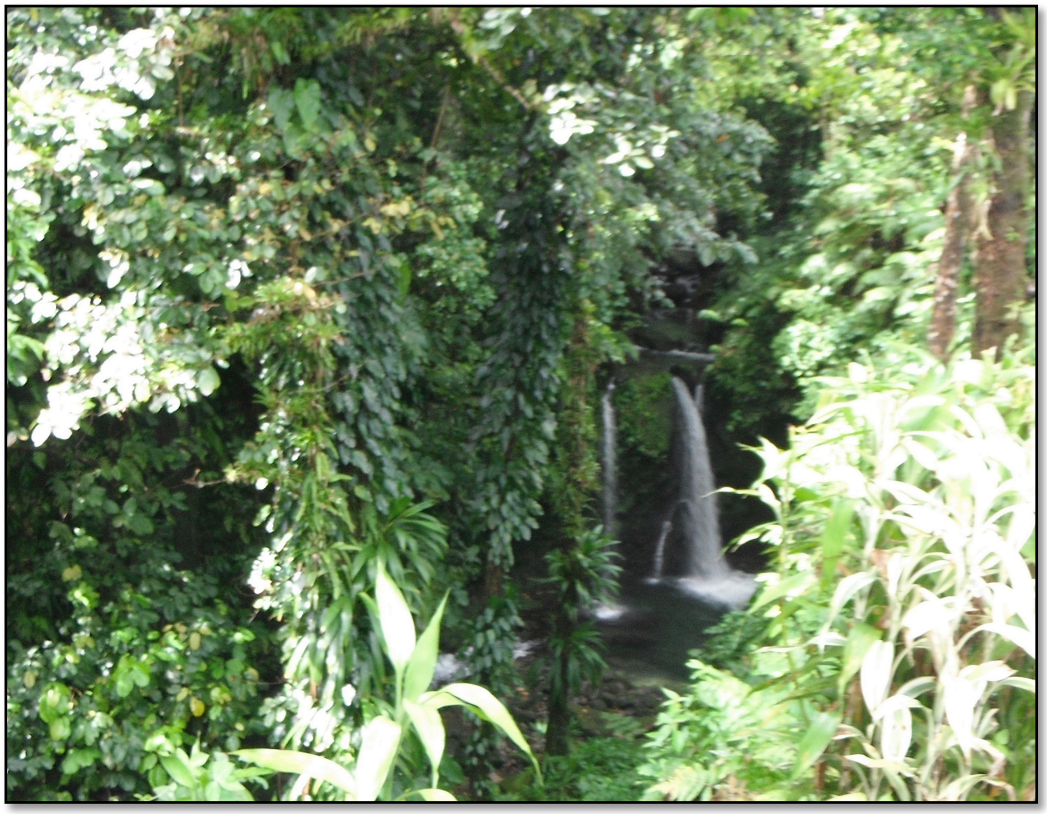

Figure 5.3 Hibiscus Falls, Dominica

The foundations of applied anthropology support the theoretical implications from this study; phenomena like the economic and environmental vulnerability of small islands or post-colonial nation building have long been topics of study for anthropologists. A new

theoretical component to add to previous work would be the strong presence of social morality in a country striving for modernity.

5.3.3 Applied Contributions

This study, or further investigation of the research problems and related topics, has potential for making applied contributions. Bulk water exportation will have significant social, cultural, political, economic, and environmental impacts. Applied anthropology and ethnography provide substantial insight into any and all of these potential impacts. This study provides a foundation for future applied work by identifying cultural attachments to water resources, local knowledge of government agreements to share and export water, as well as basic local experiences of climate change. Though the research would need to be further developed to have any impact, an elementary framework has been established by this study. Further research could contribute to better political transparency and sustainability awareness.

5.4-Suggestions for Future Research

Based on this foundational work, there is potential for future research. This specific study could be expanded on. With a larger sample size, a statistical analysis could be conducted. With significant quantitative data and the current qualitative narrative, actions could be taken to further understand and mitigate any cultural or environmental impacts Dominica is experiencing from bulk water exportation.

Figure 5.4 Distance Between Antigua and Dominica

Similar small-specialized projects, like this study, could be conducted to gain a better understanding of Dominican culture and the connection they have to nature. Many respondents in this study mentioned the lack of water in Antigua. A cross-cultural study could be done to compare the data that has already been collected on the cultural meaning of water for Dominicans with that of people from Antigua. This distance between the two islands is 190 km (118 miles) (Figure 5.4), but their ecology and access to natural resources are very different.

There is also an opportunity for larger scale research in this area. As climate change begins to have more affects globally, resource availability and willingness to share resources in Dominica may change. Similarly, Dominican epistemologies are built on the fact that there has always been an abundance of water. If this were to change, there would be significant social, political, cultural, and economic impacts along with the environmental shifts. Though Dominica is a small island in the Caribbean with a small population, it is culturally complex and there are countless possibilities for relevant and valuable future research.

Guided Conversation Topics:

1. What types of water do you have in Dominica?
   - Sea
   - River - fresh
   - River - sulfur
   - Spring
   - Rain
   - Other?

2. Are these types of water used in different ways by the Dominican people?
   - Yes ------- how do people use these different waters?
   - No ------- go to next issue.

3. Do men use water differently than women?
   - Yes ------- go to probe;
   - No ------- go to next issue.

4. How would you describe the availability of water on Dominica?

5. Have you heard the idea that Dominicans have so much water that they morally should share their surplus with the world?

   - Yes..... go to questions 5-10,
   - No, ------- go to probe.

6. Can you tell me about when and where did you first hear this statement?

7. How do you believe developed this statement?

8. How long do you think this concept has been accepted by Dominicans?

9. Do you agree that Dominicans have a moral responsibility to share their water with the world?

10. If the resource is shared, in what ways should it be shared?

11. Have you heard that the government is selling water in bulk to foreign companies who take it away by ship to be bottled elsewhere and then sold?

    - What do you think of this type of water sales?

12. Have you heard that the government is selling/giving water to cruise ships as an enticement for them to come to Dominica?

    - What do you think of this type of water sales?

13. Are the water sales mainly motivated by moral obligation, or rather as a way to bring money into Dominica?

14. Has the seasonal weather changed over the past years?

15. Do you believe that there have be drought years recently?

    - If yes, are these drought years normal or a sign that the weather is changing?

16. What would Dominica be like if there was less water on the island?

17. If there is increasing drought years should this influence whether or not Dominican water should be sold to foreign companies?

Advameg, Inc.
Last modified 2014. Accessed February 4, 2014."Dominica- Topography." Encyclopedia of the Nations. http://www.nationsencyclopedia.com/Americas/Dominica-TOPOGRAPHY.html.

Arnold, David O.
1970. Dimensional sampling: An approach for studying a small number of cases. The American Sociologist 5, (2): 147-150.

Baker, Patrick L.
1994. *Centring the periphery: chaos, order, and the ethnohistory of Dominica*. Montreal: McGill-Queen's University Press.

Bates, B., Kundzewicz, Z. W., Wu, S., & Palutikof, J.
2008. *Climate change and water*. Intergovernmental Panel on Climate Change (IPCC).

Briguglio, Lino.
1995. "Small island developing states and their economic vulnerabilities". World Development. 23 (9): 1615-1632.

Campana, Michael E.
June 24, 2009."Selling Dominica's Water: Is There Enough? A Rough Analysis." *WaterWired*., http://aquadoc.typepad.com/waterwired/2009/06/selling-dominicas-water.html.

Central Intelligence Agency.
"Dominica," World Factbook, https://www.cia.gov/library/publications/the-world-factbook/geos/do.html (accessed October 2014), under "People and Society" and "Economy."

Crate, Susan A.
2011. "Climate and Culture: Anthropology in the Era of Contemporary Climate Change". Annual Review of Anthropology. 40: 175-194.

Crother, Brian I.
1999. Caribbean amphibians and reptiles. San Diego: Academic Press.

Dominica News Online.
March 5, 2010. "Ground-breaking ceremony for Delices water project on Tuesday."http://dominicanewsonline.com/news/homepage/news/business/ground-breaking-ceremony-for-delices-water-project-on-tuesday/.

Dominica News Online.
March 9, 2010. "No water shipped to St. Lucia yet, discussions ongoing-DOWASCO manager." http://dominicanewsonline.com/news/homepage/news/business/no-water-shipped-to-st. lucia-yet-discussions-ongoing-DOWASCO-manager/.

Dominica News Online.
March 11, 2010. "Expected improvements to water systems island-wide estimated at $191M."
http://dominicanewsonline.com/news/homepage/news/business/expected-improvements-to-water-systems-island-wide-estimated-at-$191M/.

Dominica News Online.
March 22, 2010. "Dominica exceeds international standards for drinking water--minister."
http://dominicanewsonline.com/news/homepage/news/business/dominica-exceeds-international-standards-for-drinking-water-- minister/.

Dominica News Online.
April 23, 2010. "Dominica should sell its water to other countries."
http://dominicanewsonline.com/news/homepage/news/business/dominica-should-sell-its-water-to-other-countries/.

Dominica News Online.
December 2, 2010. "Dominica Faces Challenges in Exporting Bulk Water."http://dominicanewsonline.com/news/homepage/news/business/dominica-faces-challenges-in-exporting-bulk-water/.

Dominica News Online.
December 24, 2010. "DOWASCO preparing for water export business."
http://dominicanewsonline.com/news/homepage/news/business/DOWASCO-preparing-for-water-export-business/.

Dominica News Online.
December 29, 2011. "Barbados former PM advices Dominica to export water."
http://dominicanewsonline.com/news/homepage/news/business/barbados-former-pm-advices-dominica-to-export-water/.

Dominica News Online
July 24, 2012. “Fewer cruise ship calls for Dominica.”
http://dominicanewsonline.com/news/homepage/news/tourism-publicity/fewer-cruise-ships-calls-for-dominica/

Dominica News Online.
January 28, 2013. "Nature’s Water gets new ownership, product to be enhanced."
http://dominicanewsonline.com/news/homepage/news/business/nature’s-water-gets-new-ownership-product-to-be-enhanced/.

Dominica Organic Agriculture Movement
Photo Accessed October 25, 2014. http://photos-c.ak.fbcdn.net/hphotos-akash3/t1.00/c0.40.960.639/s720x720/68518_443744982376490_1960266984_n.jpg

Encyclopædia Britannica.
2013. "Dominica." *Encyclopædia Britannica Online Academic Edition*. Encyclopædia Britannica Inc., http://www.britannica.com/EBchecked/topic/168667/Dominica.

John Fa, Blair Hedges, Beatrice Ibéné, Michel Breuil, Robert Powell, Christopher Magin
2010. *Leptodactylus fallax*. In: IUCN 2014 . IUCN Red List of Threatened Species. Version 2014.1 . www.iucnredlist.org.

Flick, Uwe.
2009. An Introduction into Qualitative Research. Sage Publications.

Geertz, Clifford.
1963. “Agricultural involution: the process of ecological change in Indonesia”. Berkeley, Calif: Published for the Association of Asian Studies by University of California Press.

Hammersley, Martyn.
1992. Some reflections on ethnography and validity. International Journal of Qualitative Studies in Education 5, (3): 195.

Handwerker, W. Penn.
1998. "Consensus Analysis: Sampling Frames for Valid, Generalizable Research Findings." In Using Methods in the Field: A Practical Introduction and Casebook. Victor C. de Munck and Elisa J. Sobo, ed. Pp. 165-178.WalnutCreek,CA:AltamiraPress.

Higman, B. W.
2011. A concise history of the Caribbean. Cambridge: Cambridge University Press.

Honychurch, Lennox.
1995. The Dominica story: a history of the island. London: Macmillan.

John, B.M., Martin Parry, Mr, and Martin Parry, Mrs, eds.
2001. *Initial National Communication of the Commonwealth of Dominica under the United Nations Framework Convention on Climate Change*. Roseau, Dominica: Environmental Coordinating.

Keegan, William F.
1996. West Indian Archaeology 2 After Columbus. *Journal of Archaeological Research*, Vol. 4, No. 4, pp. 265-294

Khan, Zaina.
"Leptodactylus Fallax: Mountain Chicken." In *Encyclopedia of Life*. The Regents of the University of California, 2011. Accessed December 5, 2014. http://eol.org/pages/1048167/overview.

Lazrus, Heather.
2012. "Sea Change: Island Communities and Climate Change*". *Annual Review of Anthropology.* 41 (1): 285-301.

Lewis, James.
1990. "The Vulnerability of Small Island States to Sea Level Rise: The Need for Holistic Strategies". *Disasters.* 14 (3): 241-249.

Luke, Sir Henry.
1950. “Caribbean Circuit”. London: Nicholson and Watson.

Mantz, Jeffrey William.
2003. Lost in the fire, gained in the ash: Moral economies of exchange in Dominica. Ph.D. diss., ProQuest, UMI Dissertations Publishing.

2007. How A Huckster Becomes A Custodian of Market Morality: Traditions of Flexibility in Exchange in Dominica. Identities 14,(1):19-38.

Milton, Kay.
1997. "Ecologies: Anthropology, culture and the environment". *International Social Science Journal.* 49 (4): 477

National Wildlife Federation.
2014. "What is Phenology?" Accessed December 4, 2014. http://www.nwf.org/Wildlife/Wildlife-Conservation/Phenology.aspx.

Niddrie, D. L.
1966. Eighteenth-century settlement in the british caribbean. Transactions of the Institute of British Geographers (40): 67-80.

Pelling, Mark, and Juha I. Uitto.
2001. "Small island developing states: natural disaster vulnerability and global change". Global Environmental Change Part B: Environmental Hazards. 3 (2): 49-62.

Rahaman, Vashanti.
1997. Mountain chicken. Highlights for Children 52, (7): 12.

Rappaport, Roy.
1971. “Nature, Culture and Ecological Anthropology”. In H.L. Shapiro (ed.), *Man, Culture and Society*, Oxford: Oxford University Press

Romney, A. K., S. C. Weller, and W. H. Batchelder.
1986. Culture as consensus: a theory of culture and informant accuracy. American Anthropologist 88:313–338.

Rouse, Irving.
1992. The Tainos: rise & decline of the people who greeted Columbus. New Haven: Yale University Press.

Rudiak-Gould, Peter.
2011. "Climate change and anthropology: The importance of reception studies". Anthropology Today. 27 (2): 9-12.

Savarin, Charles A., Hon.
November 12, 2009. "Signing of a License in Favour of Sisserou Water Inc." Address presented at Press Statement, Roseau, Dominica. Web Portal. Accessed March 12, 2014. http://www.dominica.gov.dm/speeches-addresses/signing-of-a-license-in-favour-of-sisserou-water-inc.

Tickell, Crispin.
1989. Environmental refugees: the human impact of global climate change. Swindon: Natural Environment Research Council.

Toupal, Rebecca Stuart.
2001. Landscape perceptions and natural resource management: Finding the 'social' in the 'sciences' (PHD). Tucson, Arizona: University of Arizona.

Trouillot, Michel-Rolph.
1988. Peasants and capital: Dominica in the world economy. Baltimore: Johns Hopkins University Press.

Wildscreen Arkive.
"Mountain chicken (Leptodactylus fallax)." Accessed December 4, 2014. http://www.arkive.org/mountain-chicken/leptodactylus-fallax/.

Wilk, Richard.
2006. "Bottled Water". *Journal of Consumer Culture.* 6 (3): 303-325.

Williams, Magnus.
Personal Communication. Interview by the author. Roseau, Dominica. June 13, 2013.

World Resource Institute.
"Water Risk." Aqueduct. Accessed March 12, 2014. http://www.wri.org/our-work/project/aqueduct/aqueduct-atlas.

Vacations to Go.
Accessed October 21, 2014. Map. http://www.vacationstogo.com/images/ports/maps/592_w.gif