

**Earth, Water, Woman: Community and
Sustainability in Trinidad and Tobago
Curriculum Guide**

EARTH WATER WOMAN

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Chapter 1: Introduction to the Global Water Crisis and the Role of Forests in Maintaining Sustainability and Global Hydrology

Principles that Could Be Taught with this Introduction

1. Discussion around the nature and extent of the global water crisis.
2. How the global water crisis affects certain groups of people disproportionately
 - poor women and access to clean water
 - poor people of color and access to clean water
3. Some of the pollutants that make water unsafe to drink
4. How children are affected by drinking unsafe water and how women are affected
5. How the United Nations is trying to help countries and communities with the water crisis
6. How students of all ages have been involved in finding solutions
7. The role that forests play in the water cycle
8. The role that forests play in keeping water sources clean

Method: Interrupted Case: Problem Based Learning

Topic: Impacts of the Global Water Crisis on Different Groups of People; Impacts of Deforestation on Clean Water

Title: The Global Water Crisis and the Role of Forests in Maintaining Sustainability and Global Hydrology

Author: Dr. Diana Fox, Department of Anthropology, Richard La Belle and Jillian Smith, Bridgewater State University, Bridgewater MA

Objectives

Acquire knowledge of how the Global Water Crisis affects different groups of people and the relationship between clean water and sanitation.

Evaluate the shortcomings of past efforts to improve access to clean water.

Explain how the Global Water Crisis is related to other challenges women face in education and employment.

Relate forest health to water quality and availability.

Provide examples of successful efforts to improve forest health and water quality.

Key Words: deforestation, drinking water, Global Water Crisis, sanitation, sustainability, water cycle, water-borne diseases, United Nations

Activities

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Words to Know*

Water table	the surface underneath soil and dirt that is saturated with water
Groundwater	water beneath the ground, consistent of water that has seeped into the earth, source of water in wells and springs
Aquifer	a geological formation that contains or conducts groundwater, large source for springs and wells

*For a visual presentation of the water cycle that shows how these are related, see the posters available from UN Water (9).

Map Work: Conduct a search on Google Images to find maps of the current distribution of water worldwide. Compare these with projections of global climate change. How much of the water on Earth is fresh water? Of that amount, what percentage is contained in the polar ice caps?

Building Background: Prepare students to make connections between their own backgrounds and peoples' experiences with water around the world by discussing the following questions: Name the bodies of water near where you live. Where does your community's water supply come from? How does your family get water for drinking, cooking, bathing, etc.? Is your water safe for drinking/bathing etc. at the time you get it or does it need to be purified somehow? If your community has piping for water, are the pipes reliable? What are the disadvantages of having to fetch water instead of having it piped directly to you?

Budgeting: What if water cost as much as _____? (Adjust to something appropriate based on students' age/income of students' families. Ex. car payments, rent, food, medical expenses, etc.) Which would you choose to spend your money on if you couldn't have both?

Problem Solving: Think about the ways that members of the community of Fondes Amandes have improved forest health and addressed their water needs. Which of these strategies are applicable in your community? Alternately, choose a case study of a community from either the Water.org or Climate Hotmap sites below (6), such as the case study of Haiti (11). After researching the specific challenges that community faces, determine which strategies could be implemented there.

Taking Action: Explore the Clean Water Action (1) and UN Water sites (9) to find out how students have expressed their concerns about protecting sources of clean water. What concerns do you have about protecting water in your community? Consider writing a letter to your community leaders.

The Global Water Crisis

The *global water crisis* refers to the reality that millions of people around the world become sick or die each year due to water-related diseases, a lack of clean drinking water and poor sanitation (10-Water.org 2013a). These problems are interrelated in that less than two thirds of the world's population has improved sanitation facilities, and untreated fecal matter is what causes most cases of diarrhea (10-*ibid.*). In fact, improving sanitation and hygiene could reduce disease globally by 10% (10-*ibid.*).

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The global water crisis does not affect everyone evenly. In the United States, someone who takes “a five-minute shower uses more water than the average person in a developing country slum uses for an entire day” (10-Water.org 2013a). In developed countries, there are only 10 million people without access to clean water, compared to the 32 million people without access in Latin America and the Caribbean, 345 million people without access in Africa, 196 people without access in South, West and Central Asia, and 200 million people without access in Southeast and East Asia and Oceania (10-*ibid.*). Of the 780 million people who lack access to clean water, 40% live in Sub-Saharan Africa (7-United Nations 2013).

A lack of access to clean water can refer to several scenarios. Some communities do not have pipes installed in individual homes, but they may have a community standpipe. However, wells may dry up and water may not flow from the pipes consistently. The water may also be polluted. In places where there is no running water, people have to physically transport enough water from its source to their homes to meet their families’ needs, a responsibility which women and children usually bear. This burden is interconnected with obstacles women face regarding education and employment. On the most basic level of time allocation, the time spent collecting water is time that cannot be spent in school or working (10-Water.org 2013a). And when the water is contaminated, more class time and work hours are lost when children must stay home sick. Sickness can also interfere with resource-gathering (10-*ibid.*).

An additional source of water-related inequity is the disparity in the ratio of the cost of water to income around the world. In developed countries, safe water is a relatively small expense when considered alongside total income. In developing countries, the cost of safe water can make it inaccessible (10-Water.org 2013a). Even within a single community, water costs differ significantly by socioeconomic class: “people living in informal settlements (i.e. slums) often pay 5-10 times more per liter of water than wealthy people living in the same city” (10-*ibid.*). The result is that while clean water may appear to be available, people sometimes have to drink unsafe water instead because they need to allocate their income for other expenses.

Many pollutants can make water unsafe. A major source of water pollution is actually poor sanitation. Most sewage in developing countries is untreated when it is dumped into bodies of water (10-Water.org 2013a). These same bodies of water are often the sources people rely on for their water supply. Industrial wastes from factories also release chemicals into the water. Additionally, when sediment from nearby shores gets into the water, it can introduce organisms which either upset the ecological balance of the water or directly cause humans to become sick. Akilah Jaramogi, Co-founder and Director of Fondes Amandes Community Reforestation Project, cites people “dumping toxic waste into our rivers” as a source of water pollution in Trinidad & Tobago (0:30).

The United Nations (UN) has identified water as key concern in human health and global development for decades. Since the 1970s, the UN has held conferences which have addressed the critical need for planning around the resource of water (7-United Nations 2013). The UN sponsors various water-themed initiatives including World Water Day, an annual event, and the International Year of Water Cooperation, which is taking place in 2013 (7-*ibid.*). One recent step of significance was in 2010, when the UN formally recognized water as human right and delineated minimum requirements for that right to be met (7-*ibid.*). The UN included water objectives explicitly in its Millennium Development Goals but also recognizes that water is at the

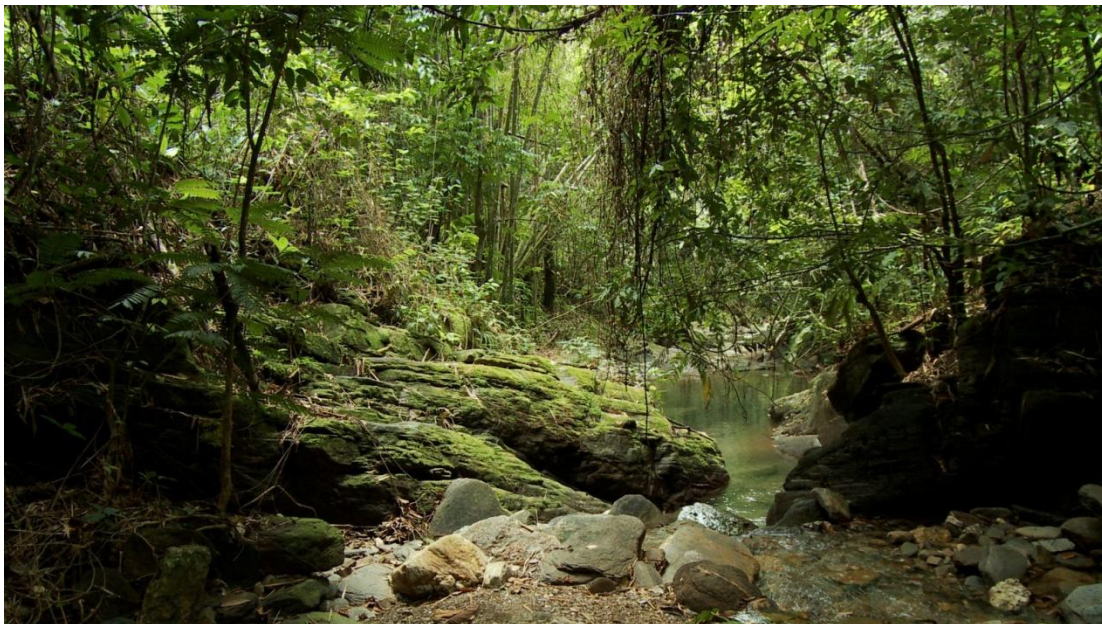
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crux of its efforts to help solve numerous issues facing the world, such as “eradicating extreme poverty and hunger; achieving universal primary education; promoting gender equality and empowering women; reducing child mortality; improving maternal health; combating HIV, AIDS, malaria and other diseases; and ensuring environmental sustainability” (7-*ibid.*). Community involvement, and the involvement of women in particular, in decision-making around water management is key. One UN document pertaining to policy implementation in China, for example, suggests that a failure to include women’s perspectives has caused many past policies to fail (8-United Nations Division for the Advancement of Women). However, it is also problematic to assume all women have the same water needs (8-*ibid.*). Perhaps the best approach is *gender mainstreaming*, which entails the careful assessment of how a policy will affect all people at each of its levels, taking into consideration differences in wealth and social status instead of seeing groups as monolithic. In the film, Penelope Beckles refers to the importance of women’s involvement in decision-making around resource management worldwide (1:30) and points to the Fondes Amandes Community Reforestation Project as a “good model to study in terms of the whole issue of economic empowerment of the people within the community” (13:35).

Children around the world have made observations about the state of water in their communities and what should be done to protect it. In the United States, the Clean Water Action organization has collected drawings from students who believe that power plants, which release heavy metals and other toxins into bodies of water, should be more strongly regulated (1). Last year in Mexico, students wrote letters to ministers and scientists attending a conference to express their understanding of the importance of water in a variety of life-supporting roles (9-UN Water).

Forests and Sustainable Water Cycle

Figure 1.1: The river in Fondes Amandes.



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Forests play a major role in cleaning and maintaining sources of water. Some of the ways in which forests are beneficial are keeping bodies of water safe from contamination, releasing water back into the atmosphere and purifying water before it reaches bodies of groundwater (Figure 1.1). In the film, John Stollmeyer explains how a forest cover is necessary to trap rainwater (10:30). Tree roots act as a barrier by covering the ground floor, protecting sources of clean water by keeping soil and other contaminants out. Trees help keep back floods, which can deposit sediment and other detritus into waters. They can help to prevent land erosion, mudslides and landslides and protect from wind erosion (4-PEFC). Trees absorb water with their roots and from leaves when it rains. The excess water that the tree does not need evaporates from the tree through its leaves. This means that the water goes back into the atmosphere, continuing the water cycle. Tree roots also help to purify water before it sinks down into the water table. They leach carbon dioxide from the air and release oxygen. Forests are vital for humans and various animals that live under their leaves.

Forests do not cover as much of the land as people might think. Anthony Ramnarine, former Conservator of Forests, Forestry Division, Trinidad & Tobago, talks about the rate of deforestation worldwide (0:50), and Dr. Carol James discusses the “cancer of deforestation” in Trinidad & Tobago specifically (1:05). The world’s forests are large, but they are disappearing every year. In 2005, forests covered 30% of the total land area. With forests covering half its land area, South America has the greatest percentage of forest-covered land area, and China has the least. According to Green Facts (3), deforestation is taking place at a rate of about 13 million hectares per year (1990-2005). This means that lands about the size of Greece are being deforested each year. Through reforestation efforts and natural forest expansion, the actual loss is around 7.3 million hectares. Some of the causes are development and logging for construction or fuel. In the film, Akilah Jaramogi explains how the forests in Trinidad & Tobago were destroyed not only by industry, but by people choosing to burn their trash (7:00). The Fondes Amandes Community Reforestation Project is an excellent example of localized efforts to restore the forest.

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Chapter 2: The Caribbean Crisis

Principles that Could be Taught with this Case Study

1. How the effects of the Global Water Crisis manifest in the Caribbean region
2. Why this region is particularly vulnerable to the effects of climate change
 - Geographical location
 - Humans
3. The relationship between climate change and available fresh water
4. How population growth increases demand for fresh water
5. How tourism increases demand for fresh water
6. Why there was a water shortage in 2010 and the measures that were taken
7. The circumstances of the present shortage
8. Some of the policy strategies that have been tried or could be tried in order to improve resource management

Method: Interrupted Case: Problem Based Learning

Topic: The Effects of the Global Water Crisis in the Caribbean Region

Title: The Caribbean Crisis

Author: Dr. Diana Fox, Department of Anthropology, Jillian Smith and Richard La Belle, Bridgewater State University, Bridgewater MA

Objectives

Explain how the Global Water Crisis affects the Caribbean region.

Consider how population growth and the tourism industry increase demand for resources.

Identify strategies for resource management that involve community input.

Key Words: Global Water Crisis, Caribbean, population growth, tourism, sustainability, climate change

Activities

Words to Know

Climate change	change in weather conditions over time
Population growth	increase in the number of people living in an area to due migration and/or an increase in births relative to deaths

Map Work: Using a map or globe, show what area the Caribbean comprises and list the nations located in the Caribbean. The CIA World Factbook is another resource that might be helpful (6).

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Figure 2.1: The islands of Trinidad and Tobago.



Building Background: Ask students what they know about the climate and geographical features of the Caribbean and what problems related to water they anticipate (hot, near Equator, island nations threatened if water level rises, etc. Figure 2.1 may help generate ideas.).

Problem Solving: Imagine a conflict in which different parties must negotiate terms for sharing a limited resource. How would you determine who may use the resource, when, and to what extent? If the students are young, it might be best to make an analogy using something tangible and immediate, such as crayons or another toy that shows wear. They could make rules about turn-taking and also how to show respect for the shared toy in order to make it last as long as possible.

The Caribbean Crisis

The Caribbean region is especially vulnerable to the effects of the Global Water Crisis. Climate change threatens to reduce the land area of the islands should the water level rise due to global warming. Related changes in weather patterns may alter rainfall and reduce the rate at which the limited freshwater stores are replenished. “While the region produces less than 1 percent of global greenhouse gas emissions, it is disproportionately vulnerable to the potential effects of climate change, with low-lying coastal areas, fragile marine eco-systems and steep slopes” (5-Caribbean Journal Staff). Even though the Caribbean region contributes relatively little to the causes of global warming, such as the high carbon emissions produced by industrialized countries like the United States, its geographical location makes it sensitive to global changes.

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In addition to the problems associated with climate change, demand for access to the already strained freshwater resources in the Caribbean is increased by population growth and tourism. Population growth in the Caribbean has resulted from both birth rates in the region and migration to the region from other parts of the world. In the 1970s and 1980s, the region saw an increase in population (7-Encyclopedia of the Nations). Some countries sought to slow the rate of population growth. For example, Jamaica's National Population Policy, adopted in 1983, tried to "promote health and increase the life expectancy of the population; to create employment opportunities and reduce unemployment, underemployment, and emigration; to provide access to family-planning services for all Jamaicans and reduce the average number of children per family from four to two, thus achieving replacement fertility levels; to promote balanced rural, urban, and regional development to achieve an optimal spatial distribution of population; and to improve the satisfaction of basic needs and the quality of life through improved housing, nutrition, education, and environmental conditions" (7-*ibid.*). Some countries, such as Trinidad and Tobago, are currently experiencing a decline in population growth (6-CIA). To see the rates for individual countries, see resource 10 below.

While they do not figure into calculations of population growth among permanent residents of Caribbean nations, tourists are responsible for a large part of resource use, as well as a large part of the region's revenue, bringing in \$21.5 billion annually (11-Erin Vaughan). In recognition of the region's economic reliance on tourism and the reality of its negative environmental impact, the Caribbean Hotel and Tourism Association formed the Caribbean Alliance for Sustainable Tourism in 1997 "in order to promote responsible environmental and social management of natural and heritage resources respectively, within the hotel and tourism sector" (4). Interestingly, while tourism contributes to environmental degradation, environmental degradation can also make the region less appealing to future tourists, as when, for example, scenic beaches may be lost to the rising water level.

In March of 2010, the Caribbean region experienced the Global Water Crisis acutely during a water shortage in which supplies reached dangerously low levels. In Trinidad and Tobago, the Water and Sewage Authority pointed to the "recklessly high consumption levels" that threatened to deplete the remaining water supply, which was already 40% in the nation's largest reservoir, before the end of the dry season (2-BBC Caribbean). By the end of April, other major reservoirs were below 50%, 30% lower than average for that time of year (9-Repeating Islands). The levels became so low that officials charged over a dozen people for non-compliance with restrictions and for selling water illegally (9-*ibid.*).

The region is currently experiencing another shortage. Already, Grenada, Anguilla, Trinidad, Antigua, St. Vincent, and Barbados have experienced unusually dry weather in the past year (1-Coto). There have also been periods of intense rain, but this does little to help the situation because it runs off before it can be absorbed into the ground and processed (1-*ibid.*). Barbados, Cuba, and the Dominican Republic have a demand for water that exceeds the available supply (1-*ibid.*). Some solutions under consideration "include limits on development, increased use of desalination plants and better management of existing water supplies, but all face challenges in a region where many governments carry heavy debts and have few new sources of revenue" (1-Coto). Jamaica, Trinidad, and Barbados have implemented rationing plans (1-*ibid.*). Government officials and nonprofit groups are concerned about health, safety, and national security issues that arise when water supplies are too low (1-*ibid.*).

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Several interested agencies have put forth policy recommendations that attempt to help resolve the shortage and prevent future shortages. The Caribbean Community Climate Change Center, located in Belize, publishes data on water use and availability for consideration by governments and private entities in developing plans for sustainable resource management (3-CCCC).

Crystal Fenwick and Fernando Miralles argue that more can be done to utilize the data already being collected to its full potential (8). They point out that statistics on water availability can be misleading when the distribution of the population is not considered alongside the distribution of water supplies. For example, about half of the rainfall in Latin America and the Caribbean is in Brazil, meaning the overall amount of water in the region does not paint a clear picture of who can reach it (8-*ibid.*). In Peru, only 10% of the water is located along the Pacific coast, which is where 90% of the population lives (8-*ibid.*). In order to come up with solutions that meet everyone's needs, "good governance requires the active participation of all stakeholders, from small farmers to major industrial and domestic consumers" (8-*ibid.*).

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Chapter 3: Fondes Amandes Case Study

Principles that Could be Taught with this Case Study

1. How the founding members of the Fondes Amandes Community Reforestation Project found sustainable solutions to concerns within their community by drawing on their Rastafarian values
 - The origins, beliefs, values and practices of Rastafari
 - Women's changing roles in Rastafari
 - Alignment of Rastafarian values with the need for environmental stewardship
2. How community activism has increased the community's power
 - How the activities of FACRP address the interests of multiple stakeholders
 - How FACRP has reduced the community's dependence on government organizations

Method: Interrupted Case: Problem Based Learning

Topic: Community Activism and Sustainability

Title: Case Study of Fondes Amandes Community Reforestation Project

Author: Dr. Diana Fox, Department of Anthropology, Jillian Smith and Richard La Belle, Bridgewater State University, Bridgewater MA

Objectives

Identify the major values and beliefs of Rastafari.

Explain how women's roles in Rastafari have changed.

Consider intersections between FACRP members' Rastafarian values and their goal of restoring the forest and water table.

List government agencies and non-governmental organizations invested in the outcomes of FACRP activities and identify any parties with conflicting interests in FACRP activities.

Name at least three ways the FACRP benefits the community.

List some of the plants the FACRP community members have reintroduced to the area.

Key Words: community activism, Rastafarian women, reforestation, sustainability

Activities

Map Work: Using the map below (Figure 3.1), locate Fondes Amandes in St. Anns, a suburb of the capital, Port of Spain. Note where Fondes Amandes is in relation to WASA land.

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Research: Investigate the FACRP's outreach activities (Kemba Jaramogi and Cowin Collett speak on this from 13:00-13:37 in the film) and see how other communities have implemented similar projects. 2, 5 and 13 below are some resources to help you get started.


Local Connections: Think about a concern facing your community. If you were interested in finding solutions through community activism, whose interests would you have to consider? Are there community leaders, government agencies or NGOs you could approach? Who would you need to contact in the event of a discrepancy? See resources 3 and 4 for comparison.

Entrepreneurship: Consider Akilah's Jewelry (see 9, below), which produces and sells beautiful, handmade jewelry made from the plants growing within Fondes Amandes. What kinds of businesses could be developed in your community based on the sustainable use of natural resources? Come up with a name for your company and draw pictures of the products you would create. What resources would you draw upon?

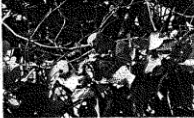
Wildlife and Agro-forestry: Using the image below (Figure 3.2), list five animals that live in Fondes Amandes. Then list five fruit trees and three hardwood trees that the FACRP has reintroduced to the area. Which of these fruits have you tried? Do any of these grow where you live?

Figure 3.2: Wildlife and trees planted in Fondes Amandes.

WILD LIFE ON THE FONDES AMANDES COMMUNITY RE-FORESTATION PROJECT



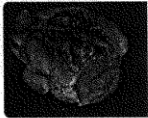

- A wide variety of wild life such as;
 - Birds
 - Butterflies
 - Agouti
 - Tattoo
 - Lappe
- Mongoose can be seen in and around the project
- Different species of frogs
- Bats
- Owls
- Termites



- Tarantella spiders
- Parrots
- Wood peckers
- Corn-birds
- Squirrels
- Snakes
- A wide variety of birds

The Fondes Amandes Community Reforestation Project continues to introduce the indigenous fruit, hard wood, and ornamental trees and shrubs that will continue to encourage the reintroduction of wild life into the community.

Lost to us are the ocelot that is now an endangered species and the deer from the Fondes Amandes Valley


Some fruit trees which have been successfully incorporated in hillside Agro-Forestry Plots.

- Cashew
- Mango
- Golden apple
- Jamaican plum
- Hog plum
- Soursup
- Sugar apple
- Papaw
- Sapodilla
- Mamey apple
- Tamarind
- Avocado
- Cinnamon
- Breadfruit
- Guava
- Pommerac
- Clove
- West Indian cherry
- Five fingers/Carambola
- Orange
- Lemons
- Grapefruit
- Mauby
- Chênette

The list of forest and hardwood trees that are being planted on the FACRP:

- Mahogany
- Cedar
- Acacia
- Juniper
- Poui
- Sand box
- Cassia
- Angeline

Fondes Amandes Community Re-forestation Project's aim
To conserve the St. Ann's watershed, using ecological restorative methods; beginning at the foot hill of the Fondes Amandes Valley aiming at reaching the naked degraded ridge of Chancellor hill.



Chancellor Ridge

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Community Activism and Women's Roles

Balagoon, one of the original Fondes Amandes Community Reforestation Project (FACRP) members, describes how, after slavery was abolished in Trinidad, the government granted estates to people who were formerly enslaved. However, when they were unable to pay taxes, the government took the land back (4:40). As the government of Trinidad and Tobago profited from the oil industry, descendants of the former slaves continued to live in poverty. The Rastafari movement, having started in Jamaica, grew during this period of resistance, which led to a Black Power revolution in 1970 that involved returning to the land in protest.

In the film, we hear Akilah Jaramogi talking about how she started the FACRP with her late husband, Tacuma, and other community members in 1982. They began replanting, but the government sent eviction letters because they did not technically own the land. However, their agro-forestry practices were undeniably beneficial to the water table and in preventing forest fires, and they were allowed to stay. Nonetheless, as Nigel David explains, the threat that the government will sell the land to developers is ongoing (18:50).

Much of the motivation for starting the FACRP came from the members' involvement with Rastafari. Rhoda Reddock points out that the Rastafarian "ideology...very much lends itself to that protective and custodial attitude towards the land" (9:40). Still, even within Rastafari, not everyone has the same interests: Akilah explains how she "wanted to do more for Rasta women" (3:50), while Tacuma and the other men "wanted to elevate the Rasta men in the community" (4:02) and sought a space for Rastafarian men's gatherings.

Women's roles in Rastafarian societies have traditionally been subservient, but there has been a rising feminist movement since the 1980s (7-Tafari-Amaa 1998 and 6-Grassroots International Media 2010). Although men have generally been considered the leaders of families within Rastafari, Rasta women have questioned this idea. In reality, many Rasta women are the primary providers of their families' income (7-*ibid.*). Akilah's Jewelry is an example of financial self-sufficiency for Rasta women (9-Akilah and Kemba Jaramogi 2014). Women's roles in community leadership are also changing. In the film, Penelope Beckles makes a case for how "women's involvement in agriculture can actually transform a society" (1:42) and says the FACRP is "a good model to study in terms of the whole issue of economic empowerment of the people within the community" (13:45).

Other Environmental NGOs in Trinidad

In addition to the FACRP, there are many groups in Trinidad and the rest of the Caribbean trying to come up with solutions for the environmental challenges the region faces due to tourism, development, resource extraction and climate change. Sustain T&T is one such organization (11). Its director, Carver Bacchus, appears in the film and talks about how bad water management practices result in many people not getting water when they turn on their taps. He goes on to outline challenges to sustainability due to a lack of understanding of relationships such as those between human activities and rising sea levels, which threaten people's homes (16:33). The Asa Wright Nature Centre, one of the earliest nature reserves in the Caribbean, is a model for conservation and plays a large role in community education initiatives (1). The Caribbean Natural Resources Institute (CANARI), responsible for a study discussed in greater detail below, is a non-profit organization that conducts research and makes

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recommendations for conservation throughout the Caribbean that take into account specific cultural and ecological factors in each community (2).

Related Government Agencies

Many of the government agencies in Trinidad and Tobago have to balance the interests of industry and community members. Wayne Clement, formerly of the Water and Sewage Authority (WASA), the same agency that served eviction letters to the Jaramogis, explains how FACRP activities have added to the available water supply because the community has “taken over and taken responsibility for part of the watershed...they are actually assisting us” (11:55). The Environmental Management Authority makes decisions related to resource use (4). When there is a conflict of someone wants to make a complaint about a ruling, the Environmental Commission of Trinidad and Tobago hears the case (3). The Institute of Marine Affairs, which collaborates with the Environmental Management Authority, monitors the conditions of water and coastal wildlife (8). The Trinidad & Tobago Meteorological Service provides data on rainfall, drought and climate change (12).

CANARI Study about Fondes Amandes

In 2010, CANARI published a case study of the FACRP (10-Melanie Hughes McDermott 2010). The study provides a detailed account of the people and agencies involved in the developmental stages of the project. Although Akilah cites 1982 as the year they started because that is when they began putting Tacuma’s expertise from working for the Forestry Division to use and investing in trees using earnings from their other jobs, Tacuma had been planting some food crops since the 1970s (10-*ibid.*). In 1990, WASA, which owns the land, served them an eviction notice (10-*ibid.*). By working with their Member of Parliament, who started the Tropical Re-Leaf Foundation, they reached a verbal agreement with WASA and the two parties planted a ceremonial tree in 1991 (10-*ibid.*). Akilah requested training in fire prevention in 1994 because controlling forest fires was one of the conditions of their agreement with WASA (10-*ibid.*). In 1999, members of the community officially registered as FACRP with the Ministry of Community Development (10-*ibid.*). Since then, they have relied on a tradition of volunteerism, grants and contributions from the profits of Akilah’s Jewelry business (10-*ibid.*). FACRP also managed to secure a significant grant from the National Reforestation and Watershed Rehabilitation Programme, despite not supporting the ruling political party, due to having earned a prestigious award from the president (10-*ibid.*).

The CANARI study also outlines the eight major activities the FACRP is currently focused on, which include tree planting, forest fire prevention, organic gardening/permaculture, Clean Tree Organic Nursery, community eco-tourism, community recycling/composting, craft and cottage industry, and music, culture and community empowerment (10-*ibid.*). The CANARI study points out that the community recycling initiative had been met with limited success at the time of publication, and to date this is a continuing effort; a January 30 post to the FACRP Facebook page links to an article about the challenges of recycling throughout Trinidad and Tobago (5). The craft and cottage industry activities are also still in development. Although some community members have received training in cottage industry skills, none of the community members, at the time of the CANARI study, had used the training to generate revenue (10).

References for Further Study

Earth, Water, Woman: Community and Sustainability in Trinidad and Tobago Curriculum Guide

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4. Environmental Management Authority. 2013. Homepage. www.ema.co.tt Accessed 28 January 2014.
5. Fondes Amandes Community Reforestation Project. 2014. FACRP Facebook page. <https://www.facebook.com/facrp> Accessed 28 January 2014.
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11. Sustain T&T: Sustainable Living in Trinidad and Tobago. 2014. Sustain T&T Facebook page. <https://www.facebook.com/SustainTT> Accessed 28 January 2014.
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Chapter 4: Cambodian Case Study

Drinking What You Float On: Living in a Floating Village in Cambodia

Principles that Could be Taught with this Case Study

1. Basic methods of treating source water for drinking water in the developing world
2. Seasonal impacts on quality and access to drinking water for floating villages
3. Importance of bacterial transmission cycle in public health
4. Principles for providing bacterially safe drinking water
5. WHO standards for safe drinking water
6. Life and culture in floating village in Cambodia
7. Culturally appropriate methods in developing water treatment
8. Gender impacts in obtaining drinking water
9. Clean water has to be linked to an understanding of personal hygiene

Method: Interrupted Case: Problem Based Learning

Topic: Impacts of Lack of Drinking Water Access on Health and Poverty

Title: Drinking What You Float On

Author: Kevin D. Curry, Department of Biological Sciences, Bridgewater State University, Bridgewater, MA

Objectives

Acquire knowledge of the following: impacts of waterborne disease in Cambodia; common point of use treatment methods for drinking water.

Acquire knowledge of how to break the bacterial transmission cycle causing illness.

Conduct independent research on the effectiveness of different water treatment methods used in developing countries.

Evaluate how treated household storage water can increase in bacteria.

Research methods on how to prevent increases in bacteria in treated household storage water.

Evaluate the importance of hygiene education in breaking the bacterial transmission cycle.

Key Words: Floating Villages, drinking water, point of use water treatment, diarrhea, biosand filter, Cambodia, Southeast Asia, developing world, reduction of waterborne illness

NOTES for Developing the Story

What do you do for drinking water if you live in a floating house on the largest freshwater lake in all of Southeast Asia with over 185 other families?

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Over 95% of the members in your community are fishermen and use the lake for their livelihood as well as the latrine, washing clothes, personal hygiene and sanitation.

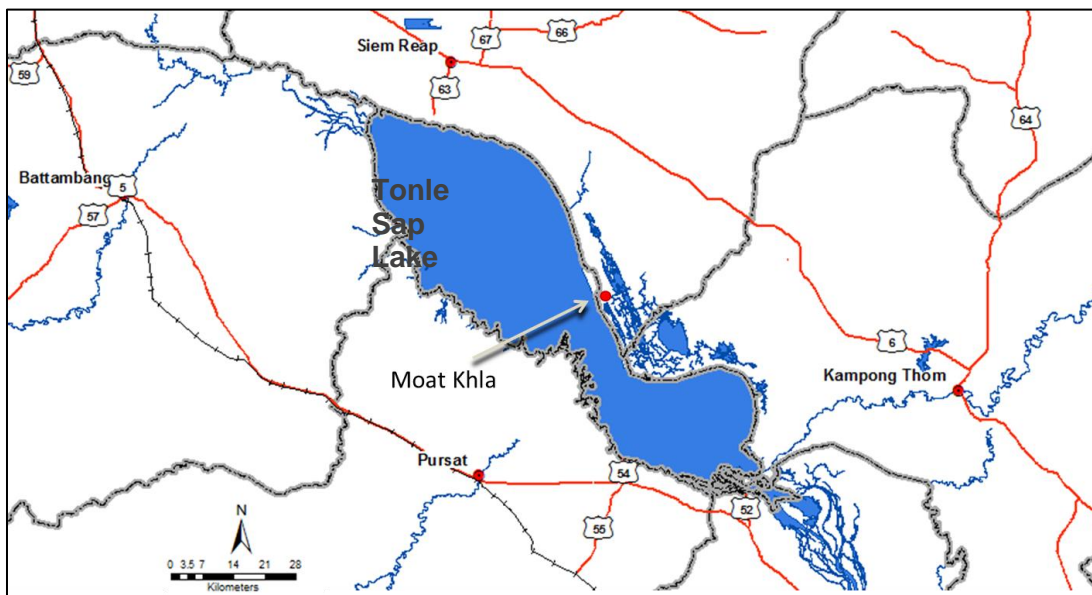
The lake is used for everything that requires water.

Clean water is only one part of maintaining health. Understanding hygiene and how to keep the water clean is key to decreasing illness and maintaining health (2-Enger et. al 2013).

Background on Moat Khla Floating Village

Moat Khla floating village is in Anlong Samnar Commune, Chi Kraeng District within Siem Reap Province (Figure 4.1). Primarily a fishing community, 184 out of 189 families are involved in some aspect of fishing or fish cage culture with a total population of 700 people (3-NCDD 2013). Being a floating village on the Tonle Sap, all 189 families use the natural lake/river for their water source which by WHO standards is deemed unsafe. As for the rest of Anlong Samnar commune, 492 families out of 2463 use drinking water from a safe source or 20%. In Moat Khla, 36 of 189 (19%) boil their drinking water compared to 24.3% in the commune. At the time of the village survey in 2010, only 10 Moat Khla families filtered their drinking water compared to 610 for the entire commune. Today over 80 families filter their drinking water in Moat Khla.

Figure 4.1: Location of Moat Khla floating village on the Tonle Sap Lake, Cambodia.



In March 2012, the World Health Organization and UNICEF Joint Monitoring Program (JMP) reported that UN Millenium Development Goal 7 Target 10 for sustainable access to clean water targets for halving the number of people without sustainable access to “improved water” had been achieved ahead of the 2015 target year (6-WHO 2012, 7-WHO/UNICEF 2012, 4-UN News Center 2012). Though sustainable access to improved drinking water became the proxy criteria for the original guideline, it does not necessarily mean the water is free of bacterial contaminants and could still exceed WHO drinking water guidelines for E. coli bacteria (7-WHO/UNICEF 2012). As this may be true for villages in developing countries using unimproved or unprotected sources of drinking water like ponds, rivers, springs or wells, it is especially true for communities that live on their drinking water source in floating villages.

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The Tonle Sap is the largest freshwater lake in all of Southeast Asia and changes dramatically in size between the dry season period in late October to late April and the rainy season between May and mid-October. So much water comes down the Mekong River during the later part of the rainy season that it prevents the lake from draining and actually reverses the flow of the Tonle Sap River so the lake changes from 2,000 square kilometers to almost 12,000 square kilometers in area. The maximum depth of the lake changes from about 1.5 meters to almost 10 meters. This flood pulse of water and nutrients released from the flooded forest and surrounding land create a unique environment for many species of fish to reproduce and grow.

Life in Moat Khla Village

Life in the Moat Khla village can be challenging. Monsoon rains swell the volume of the lake and by late October the water is deep and a beautiful translucent green. The floating homes in the village are spread out and tied to whatever trees that are still sticking out above the water.

Swimming and washing is refreshing and neighbors are not close by. By late February to early March, most floating houses are lined along the Moat Khla river channel flowing into the lake.

As the lake level has drops, many villagers make temporary platforms for sleeping and more space so then can easily get to the land and gather firewood and use the land to relieve themselves since they have no latrine on their temporary houses. If they have a latrine, it's usually two boards over an open area at the back corner of their floating home. Families making more than \$1 a day may have an enclosed latrine with a roof. For others it's just poles around the squatting area with some cut up fish feed bags for privacy.

Most men of the village are on the lake tending nets and fish traps most of the day, wading in the water where necessary to place and repair long nets that either catch the fish or lead them to a fish trap. Mothers and daughters spend most of the morning cleaning clothes in their 20-30 liter metal wash basin and rinse the clothes in the lake. Of course this occurs after a long night of rest on a foam pad or mat on a wooden platform under the mosquito nets. Breakfast is early and often rice and pan fried fish. After washing up and rinsing toothbrushes in the lake, personal hygiene items are stored in the kitchen or near the latrine. Since the water is high and clear, we dip our buckets for drinking water right in front of the house rather than paddling away from our neighbors when we are all close together in the peak of the dry season. Fortunately we don't need to use the wood to boil our water like we do during the dry season. The water is so dirty then and looks brown from the lake bottom being stirred up by everyone coming by in their boats all day.

Some women in the village have a small boat converted to a floating supply store of everyday household needs and fast food like dried noodle packages or other produce items that are easy to store. Young women that are not in school work at the fish processing dock, chopping heads and fins off of hundreds of small fish that are sold to a middleman for sale in the local inland villages near the lake. As they chop fish all day on the fish processing dock, the waste is easily washed into the lake. A day's wage is usually 10,000 Cambodian Riel or about \$2.50 USD.

This week a team from Water for Cambodia came to our village to test water filters that several families had purchased two months ago (see 5 below). The concrete filter boxes are very heavy and only families who have a sturdy wood plank floating platform for their home can support one (Figure 4.2). Several of us do not have filters because we cannot afford the \$7 USD deposit for

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owning a BSF or the bamboo flooring in our house is not strong enough to support one. We keep our stored water in different buckets or water jars. Mr. Seur from WfC asked if he could take a sample of our stored water and wanted to know where we get our drinking water each day since we do not yet have a filter. Some of us buy 20 liters for 1000 Riel from the water vendor that runs a UV treatment and filtration system. The Asian Development Bank sponsored this floating treatment system for our village but it does not work properly in the dry season since the water is so brown and clogs the filters in their system. The rest of us just use the lake water to save money. My three children help with collecting the water each day but my 3 year old daughter is not feeling well and has had diarrhea for 4 days now. Until my husband comes home from fishing, we cannot buy the medicine from the local vendor to help treat her stomach illness. Her older brother is just finally recovering from this same illness after two weeks and was not able to attend the floating school. Today was very sad day as our neighbors had to temporarily bury their 2 year old son in the tree tops in the cemetery forest further upriver until the water levels recede and the body can be properly buried according to traditional Khmer Buddhist custom.

Figure 4.2: Biosand filters in a floating village home in Moat Khla village. Local Buddhist Wat for Moat Khla in the background is on stilts to keep from flooding in the rainy season.



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http://www.who.int/household_water/research/technologies_intro/en/index.html. Accessed 10 Dec 2013.

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http://www.who.int/water_sanitation_health/publications/2012/jmp_report/en/. Accessed 10 Dec 2013.

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Chapter 5: Conclusion

Principles that Could be Taught with this Case Study

1. How the Global Water Crisis and local water management are interrelated
 - How communities have worked to find solutions at local levels
 - FACRP
 - Water for Cambodia
2. How this information can be applied in other communities

Method: Interrupted Case: Problem Based Learning

Topic: Reflection on the Global Water Crisis

Title: Self-Reflective View on the Global Water Crisis

Author: Dr. Diana Fox, Department of Anthropology, Richard La Belle and Jillian Smith, Bridgewater State University, Bridgewater MA

Objectives

Reflect on global, regional and local water issues addressed in previous chapters.

Determine ways to manage water issues at the global, community and individual levels.

Key Words: Global Water Crisis, community resource management

Activities

The Big Picture: Using everything you have learned and drawing inspiration from The Story of Stuff videos (below), create a short presentation on how we can help address, manage or even reverse the effects of the Global Water Crisis. This plan should be as simple and easy to maintain as possible.

“The Story of Stuff” explains how raw resources become the products we put in our houses and what later happens to these products when we discard them (1c below).

“The Story of Bottled Water” is the explanation of how bottled water is wastefully sourced and packaged. It debunks myths about health benefits of bottled water versus tap water (1b below).

“The Story of Solutions” discusses how we can change the world we live in for the better and offers ideas on how to modify our way of thinking and consuming in order to waste less (1a below).

Publishing Locally: Based on your knowledge of the Global Water Crisis and what you have learned from the film and the chapters on the FACRP and Water for Cambodia, think of solutions applicable to local water problems in your community. Do all people in your community have equal access to water and other resources? Be sure to consider how to involve input from all members of the community. Then, create your own video, slideshow, poster or book to communicate your suggestions.

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Individual Impact: What can you personally do to lessen your impact on the Global Water Crisis? Be sure to include any and all ideas you may have. These could be as simple (i.e. lessening your waste of water) or as complex (i.e. carrying a reusable water bottle or planting trees) as you would like. This will be your contribution, so make sure it goes along with everything you have been talking about and working on thus far.

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- 2007. Original film. <http://www.youtube.com/watch?v=9GorqroiqgM> Accessed 6 February 2014.



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Annotations for References

1: Introduction

1. Clean Water Action. 2013. Kids Get It. <http://cleanwateraction.org/kids-get-it> Accessed 20 December 2013.

This page on the Clean Water Action organization's website features pictures students drew for a campaign against water pollution by power plants. There are examples of drawings from students of all ages which reflect their understanding of the relationship between regulating power plants' output of toxic chemicals and heavy metals and keeping local sources of water clean. U.S. residents can also choose the Explore Your Community option to find out about happenings in many states with Clean Water Action offices.

2. Food and Agriculture Organization of the United Nations. 2003. Forests and freshwater: vital connections. <http://www.fao.org/english/newsroom/focus/2003/wfc2.htm>. Accessed 15 Sept. 2013.

This article looks at how important water is to people and what is being done about protecting these sources of water. It also covers how important forests are in filtering water using the trees' roots.

3. Green Facts. 2006. Scientific Facts on Forests. <http://www.greenfacts.org/en/forests/index.htm#2>. Accessed 15 Sept. 2013.

This site looks at how forests are important to the global water cycle. It looks at, in great detail, the amount of forests that are still around and their roles and functions as they pertain to the global water cycle.

4. Program for the Endorsement of Forest Certification. 2013. Water and Soil. <http://www.pefc.org/forest-issues/sustainability/water>. Accessed 15 Sept. 2013

This article discusses the importance of the roles that forests and trees play in the water cycle and keeping sources of water clean.

5. Saint Leo University LibGuides. 2013. Social Justice Across the Curriculum 2013: The Global Water Crisis. <http://saintleo.libguides.com/water> Accessed 29 Oct. 2013.

This resource includes an excellent graphic representation of the causes and consequences of the global water crisis. It also reveals some unexpected ways humans are dependent on water which must be accounted for in calculations of the growing demand for water.

6. Union of Concerned Scientists. 2011. Climate Hotmap: Global Warming Effects around the World. <http://www.climatehotmap.org/> Accessed 11 Nov. 2013.

This interactive map allows the viewer to select from a list of effects of global warming in order to see which regions receive the most impact from each. Further information about climate

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impacts on people, freshwater, oceans, ecosystems and temperature is available in another tab of the site. A final tab leads the viewer to region-specific solutions to global warming.

7. United Nations. 2013. Global Issues: Water. <http://www.un.org/en/globalissues/water/> Accessed 29 Oct. 2013.

This site summarizes the history of UN efforts to address the global water crisis, recent progress, new challenges to sustainable development, and key updates from the Millennium Development Goals Report 2012. It explains how many regions are affected, but 40% of people without improved drinking water live in Sub-Saharan Africa. One important consideration in measuring progress is the challenge of increasing access to improved water supplies at a rate that keeps up with population growth. The site also reports that, since July 2010, water and sanitation have been recognized officially as a human right. The UN General Assembly defines this right as access to enough safe water for personal and domestic uses, which has to be affordable, within a kilometer of a person's home, and able to be collected within 30 minutes.

8. United Nations Division for the Advancement of Women. 2005. Women 2000 and Beyond. <http://www.un.org/womenwatch/daw/public/Feb05.pdf> Accessed 29 Oct. 2013.

This handbook provides critical information for promoting the goals of the Beijing Declaration. It summarizes the effects of the global water crisis on women, identifies weaknesses in past policies and calls attention to cultural factors that need to be addressed in policy planning. Gender concerns are often assumed to be taken into consideration in community-based resource management, but this handbook asserts that this assumption is not always true. Women need to be directly involved because their interests may not align entirely with those of men, even if they live in the same household. Special attention needs to be given to ensure women's inclusion in decision-making through a process known as *gender mainstreaming*. This entails careful assessment of how a policy will affect all people at each of its levels. The handbook explains how the benefits of this strategy in terms of efficiency make it worthwhile, but just as importantly, it helps empower women in the community.

9. UN Water. 2013. UN Water: World Water Day 2013: International Year of Water Cooperation: Youth and Kids: Publications and Educational Tools. <http://www.unwater.org/water-cooperation-2013/youth-and-kids/publications-and-tools/en/> Accessed 20 December 2013.

This page on the UN Water website provides a variety of resources, games, videos and links for Youth and Kids related to World Water Day 2013, which coincided with the International Year of Water Cooperation. The Publications and Tools section offers examples of ways students around the world have gotten involved in protecting their water resources, such as how students in Mexico wrote letters to ministers and scientists asking them to voice their thoughts at an upcoming conference, available here:

<http://unesdoc.unesco.org/images/0014/001492/149219M.pdf>. There is a pdf of a curriculum guide and activities specifically targeted to Latin America and the Caribbean available here: http://www.unesco.org/new/fileadmin/MULTIMEDIA/HQ/SC/pdf/Water_and_education_UNESCO_WET_en.pdf. There are also illustrated posters about the water cycle available for download in English, Spanish, French, Croatian, German, Portuguese and Malay.

10. Water.org. 2013. <http://water.org/> Accessed 29 Oct. 2013.

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This site offers a collection of facts about the global water crisis pertaining to water, children, disease, economics, sanitation and women. It reveals the scope of the crisis and how it now affects one billion people. It also details “The Women’s Crisis,” which refers to the ways the dual problems of inadequate access to clean water and a lack of sanitation interfere with women’s education, health, and economic opportunities. Worldwide, women and girls carry the bulk of the responsibilities for collecting water for their families, which takes up much of their time. Consequently, they have less time for school or work. Besides the time they must spend collecting water, girls face additional obstacles to their education due to the lack of sanitation. Girls miss school days due to water-related illness, and the lack of toilets and privacy in half of schools around the world results in many girls dropping out when they reach puberty. The site features an interactive map which illustrates how many people in different regions are without clean water. The site also suggests remedies to the water crisis and provides examples of the solutions implemented in several featured projects in various locations. Finally, the site provides a resource page with links to related media organized by topic, including issues with drinking water in the U.S.

11. Water.org. 2013. Haiti. <http://water.org/country/haiti/> Accessed 29 Oct. 2013.

This page outlines Water.org’s commitment to work with Haitians to improve access to clean water and sanitation. This is important because 40% of Haiti’s population of ten million currently lacks safe water, and 80% of the population does not have sanitary toilets. Water.org representatives stated their goal, to reach fifty thousand Haitians by June of 2014, at the 2009 at the Clinton Global Initiative Annual Meeting.

2: The Caribbean Crisis

1. Coto, Danica. 2013. Climate Change Threatens Caribbean’s Water Supply. <http://phys.org/news/2013-09-climate-threatens-caribbean.html> Accessed 18 December 2013.

Danica Coto’s news article, “Climate Change Threatens Caribbean’s Water Supply,” examines how climate change will affect access to clean drinking water in the Caribbean. One concern is that the rising sea level will contaminate supplies of fresh water. Another concern is that the existing supplies will dwindle as decreased rainfall, an anticipated result of changing weather patterns, means they will not be replenished at the same rate.

2. BBC Caribbean. 2010. Water Shortage Crisis. http://www.bbc.co.uk/caribbean/news/story/2010/03/100330_lunchbriefs.shtml Accessed 18 December 2013.

This is a British Broadcasting (BBC) article that looks briefly at the Caribbean Water Crisis. It uses the same data as the article below (9-Repeating Islands) and presents it in a concise format.

3. Caribbean Community Climate Change Centre. 2013. Empowering People to Act on Climate Change. <http://www.caribbeanclimate.bz/> Accessed 18 December 2013.

This is the website of the Caribbean Community Climate Change Centre (CCCCC). Located in Belize, the Centre coordinates regional efforts to monitor and react to climate change. It also

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serves as a clearinghouse for regional climate change data. A full list of the Centre's functions is available on the site, as are lists of past and ongoing projects. Additionally, the site provides background information on climate change, the greenhouse effect, and historic atmospheric carbon dioxide change with relevant videos embedded in the page to visually support the content. The database section has a wealth of information to explore, such as models of projected climate change and data broken down by country.

4. Caribbean Hotel and Tourism Association. 2013. Caribbean Alliance for Sustainable Tourism (CAST) <http://www.caribbeanhotelandtourism.com/CAST.php> Accessed 18 December 2013. This page highlights the goals of the Caribbean Alliance for Sustainable Tourism (CAST). Founded in 1997, their mission is "to enhance the practices of the region's hotel and tourism operators by providing high quality education and training related to sustainable tourism; promoting the industry's efforts and successes to the traveling public and other stakeholders; and serving as a vital link to all stakeholders with sustainable tourism interests in the Caribbean region." It is a not-for-profit subsidiary of the Caribbean Hotel and Tourism Association which focuses on working with the private sector to encourage responsible resource use.

5. Caribbean Journal Staff. 2013. Climate Change and Caribbean Tourism. <http://www.caribjournal.com/2013/09/18/climate-change-and-caribbean-tourism/> Accessed 18 December 2013.

This short article from the *Caribbean Journal* explains the effects climate change will likely have on Caribbean tourism. Although the region is responsible for less than 1% of global greenhouse gas emissions, it is especially vulnerable to their effects. Social media is discussed as a possible avenue for informing the general public about best practices for sustainability.

6. Central Intelligence Agency (CIA). 2013. Central American and Caribbean: Trinidad and Tobago. <https://www.cia.gov/library/publications/the-world-factbook/geos/td.html> Accessed 18 December 2013.

This resource provides a host of statistics for each country, including geographic data, demographics, and information about the structure of the government and economy. On the Trinidad and Tobago page, the People and Society section has data on drinking water and sanitation facility access.

7. Encyclopedia of the Nations. 1987. Caribbean Islands. <http://www.country-data.com/cgi-bin/query/r-3158.html> Accessed 18 December 2013.

This report contains data from the Jamaican census about demographics and the goal of controlling population growth. This information, while dated, is useful for explaining the relationship between population growth and stress on natural resources and offers a summary of past policies as well.

8. Fenwick, Crystal and Fernando Miralles. 2013. How Latin American and the Caribbean can help avoid a water crisis. <http://blogs.iadb.org/agua/2013/09/19/water-crisis/> Accessed 18 December 2013.

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This article from the Banco Interamericano de Desarrollo (BID) explains how macro level data about water distribution can be misleading. It considers possible sources of conflict in managing water resources. The authors propose suggestions for improving data management, shifting the focus from increasing water supply to conserving the available supply, and encouraging the participation of all stakeholders in water governance.

9. Repeating Islands. 2010. Water Crisis in Trinidad.

<http://repeatingislands.com/2010/03/31/water-crisis-in-trinidad/> Accessed 18 December 2013.

This site covers the 2010 water shortage in Trinidad and Tobago. The Water and Sewage Authority (WASA) warned citizens that the “consumption levels” of water were “recklessly high.” The reservoirs’ supplies were significantly below the levels that were typical for that time of year, falling to 40% in Arena Dam, which is the largest reservoir. 1.3 million people were relying on supplies that were $\frac{1}{3}$ their regular levels and unlikely to last the season if people continued to use them at the same rate. The water supply was so scarce and the rations so strict that people were criminally charged for wasting water and selling water illegally.

The site also offers a link to the report where this information came from:

<http://www.france24.com/en/20100330-water-crisis-trinidad-authorities>

10. Saundry, Peter. 2009. Latin America and Caribbean Population Growth Rates.

<http://www.eoearth.org/view/article/154178/> Accessed 18 December 2013.

This resource shows population growth in Latin America and the Caribbean by region and by country for 2009.

11. Vaughan, Erin. 2013. Constraints Affecting Tourism in the Caribbean.

http://www.ehow.com/info_7903496_constraints-affecting-tourism-caribbean.html Accessed 18 December 2013.

This article examines the tourist industry in the Caribbean and the relationship between resource use and tourism. Tourism adds to the demand for fresh water, which is already strained. Poor waste management adds to the problem. From 2000-2005, there were at least 55 outbreaks of food- or water-related illnesses.

3: Fondes Amandes Case Study

1. Asa Wright Nature Centre (AWNC). 2014. Homepage. www.asawright.org Accessed 28 January 2014.

This is the homepage for the Asa Wright Nature Centre, one of the first nature reserves in the Caribbean, which was established in 1967 and includes almost 1500 acres of protected forests. Once a plantation, much of the area has been taken back over by secondary forest and is home to a diverse array of species. Conservation education is a priority, and the AWNC is involved with many ongoing projects and partnerships throughout Trinidad and Tobago. The site includes details about specific initiatives, the types of wildlife within the AWNC and information for individual visitors as well as those planning school trips.

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2. Caribbean Natural Resources Institute (CANARI). 2014. Homepage. www.canari.org Accessed 28 January 2014.

CANARI is a non-profit organization “promoting participatory natural resource management in the Caribbean region.” Growing out of the Eastern Caribbean Natural Area Management Programme and initiatives sponsored by the Rockefeller Brothers Fund and the University of Michigan’s School of Natural Resources in the 1970s, CANARI was established in 1989. The Programmes and Publications & Information tabs provide links to strategic plans and reports on topics relevant to conservation in the Caribbean region, including considerations such as how gender impacts on participation and the challenges of working with specific ecosystems of the Caribbean. To see the 2010 CANARI case study of Fondes Amandes, visit the link in resource 10.

3. Environmental Commission of Trinidad & Tobago. 2014. Homepage. www.ttenvironmentalcommission.org Accessed 28 January 2014.

The Environmental Commission of Trinidad & Tobago is a court that rules in environmental matters. Included in its Mission Statement is a goal to “protect the rights of citizens while being cognizant of the need for the balancing of economic growth with environmentally sound practices.” The Legislation & Judgments tab provides a record of the Court’s rulings, and the Represent Yourself in Court tab provides resources for citizens to prepare for their hearings.

4. Environmental Management Authority. 2013. Homepage. www.ema.co.tt Accessed 28 January 2014.

The Environmental Management Authority is a government organization that was established in 1995 in order to consolidate the responsibilities of environmental management in Trinidad and Tobago. An update to the legislation that provided for the start of the Environmental Management Authority mandated the establishment of the Environmental Commission in 2000 (see 3 above). The Environmental Management Authority develops laws and regulations for conservation and management, and the Environmental Commission hears appeals when parties dispute the decisions made by the Authority.

5. Fondes Amandes Community Reforestation Project. 2014. FACRP Facebook page. <https://www.facebook.com/facrp> Accessed 28 January 2014.

This link provides access to the Facebook page for FACRP, which is updated regularly with information about upcoming events, environmental news, stories of work being done and photos of plant and animal life thriving in Fondes Amandes.

6. Grassroots International Media. 2010. Link to preview of the film Rastafari Women Today. <http://vimeo.com/10653070>. Accessed 28 January 2014.

The Rastafari Women Today series explores the lives of Rastafari women. The first part focuses on the stories of Rastafari Elder Women. It includes interviews and footage from Rastafari history.

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7. Imani M. Tafari-Amaa. 1998. "Rasta Woman as Rebel" in *Chanting Down Babylon: The Rastafari Reader*, edited by N. Samuel Murrell, William D. Spencer and Adrian Anthony. Temple University Press.

Link to introduction: http://www.temple.edu/tempresstitles/1244_reg.html

Link to chapter preview:

http://books.google.com/books?id=iesWzLHb_GUC&pg=PA89&lpq=PA89&dq=rasta+woman+a+s+rebel&source=bl&ots=T1JWGmA2OX&sig=1eMB0tt6x4wdup7grekCeYsd1F4&hl=en&sa=X&ei=BaHpUqOcCqLUsASQmYD4Bq&ved=0CF4Q6AEwCw#v=onepage&q&f=false Accessed 2 February 2014.

The introduction to the volume outlines the origins of Rastafari in Kingston, Jamaica in the early 20th century, discusses common stereotypes of Rastas and the complicated relationship Rastafari has with Christianity and the Ethiopian Orthodox Church, explains the significance of Emperor Haile Selassie and Marcus Garvey and examines Bob Marley's impact on international awareness and the popularity of Rastafari. It begins to highlight how sistren have demanded that the brethren "reevaluate their patriarchal view of sexuality" since the 1980s.

The free online preview of the "Rasta Woman as Rebel" chapter details the changing roles of Rastafari women in greater depth. Despite the importance of figures like Nanny the Ashanti Maroon Queen, a Jamaican national hero who successfully led an army against the British, women in general have traditionally played subservient roles in Rastafari. A significant 1989 meeting of brethren and sistren at the headquarters of the Sistren Theater Collective began an ongoing conversation about women's roles in Rastafari and the possibilities for change. Although Rastafari men are considered the "heads" in their families, statistics show that many women are actually heads of households when there is no man in the family or the woman is the primary contributor to the household income. The author describes how many women become acquainted with Rastafari in the context of a relationship, which may not last, and some women choose to continue their involvement with Rastafari after such a relationship. This situation creates an opportunity to ask questions and reevaluate certain beliefs, particularly regarding the roles of brethren and sistren. Other topics addressed are the contradiction between the ideal of a male breadwinner and reality, which means many women are taking on this responsibility without the benefits of the power that comes along with it; practices of segregation during women's menstruation; domestic violence within Rastafari; the importance of appearances and the association with Babylon that comes with wearing certain clothing; and parallels between changes in gender roles within Rastafari and in the larger society.

8. Institute of Marine Affairs (IMA). 2012. Homepage. www.ima.gov.tt Accessed 28 January 2014.

The Institute of Marine Affairs conducts and publishes research on fisheries, aquaculture, oceanography, coastal processes, marine chemistry and biodiversity. The IMA studies populations of fish to understand how industries may harvest them sustainably and how pollution on land affects the health of marine ecosystems. The IMA monitors and assesses water quality and makes recommendations for improving practices around its use. The Research and Publications tabs provide detailed information about specific projects and partnerships, such as collaboration with other government agencies, including the Environmental Management Authority (see 4 above).

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9. Jaramogi, Akilah and Kemba Jaramogi. 2014. Akilah's Jewelry. <https://www.facebook.com/AkilahsJewelry> and <http://kjaramogi.wix.com/akilahs-jewelry> Accessed 28 January 2014.

These sites showcase handmade jewelry designs created by Akilah and Kemba Jaramogi. The raw materials all come from the forests of Trinidad and Tobago. This business demonstrates their financial self-sufficiency.

10. McDermott, Melanie Hughes (with CANARI). 2010. The Fondes Amandes Community Reforestation Project: Improving Watershed Management and Community. <http://www.canari.org/documents/FACRPcasestudyfinal41010.pdf> Accessed 2 February 2014.

This case study explains the history of the Fondes Amandes Community Reforestation Project and identifies the government agencies and NGOs involved in various capacities as well as what they stand to gain from the project. It shows the impact the FACRP has had on the community and the impact it has had on the watershed, outlines the project's goals going forward and provides recommendations based upon an analysis of the information collected.

11. Sustain T&T: Sustainable Living in Trinidad and Tobago. 2014. Sustain T&T Facebook page. <https://www.facebook.com/SustainTT> Accessed 28 January 2014.

Founded in 2010 and directed by Carver Bacchus (who appears in the film), Sustain T&T aims to share educational information about environmental problems and solutions within the communities and industries of Trinidad & Tobago. The Facebook page links to current news articles pertaining to events affecting sustainability. In January 2014, there are links to coverage of the recent series of oil spills, the worst in Trinidad's history, by a state-operated oil company.

12. Trinidad & Tobago Meteorological Service. 2013. Homepage. www.metoffice.gov.tt Accessed 2 February 2014.

This site provides information about the history of the Trinidad & Tobago Meteorological Service and is updated with current forecasts for the region. The Climate tab includes information about the climate and climate change in Trinidad and Tobago, as well as data on rainfall and drought conditions over time.

13. Tropical Re-Leaf Foundation. 2014. FACRP. http://members.tripod.com/~EMPAL_2/FACRP.html Accessed 2 February 2014.

This page is a summary of the background and goals of the Fondes Amandes Community Reforestation Project compiled by the Tropical Re-Leaf Foundation, which was founded by the same Member of Parliament who helped the Jaramogis negotiate with the Water and Sewage Authority to allow them to stay in Fondes Amandes. It examines the Project's successes in forest fire prevention and community education through projects for youth and outlines community members' ideas for projects to be implemented in the future.

4: Cambodia Case Study

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1. CAWST (Center for Affordable Water and Sanitation Technology). 2011. Household Water Treatment and Safe Storage Fact Sheets (Detailed).

http://resources.cawst.org/package/household-water-treatment-and-safe-storage-fact-sheets-detailed_en

These fact sheets provide information on the efficacy of different techniques for treating and storing water safely. Specific techniques covered are source protection; the use of chemical and natural coagulants; settling; biosand, ceramic candle, ceramic pot, and membrane filters; straining, boiling, chlorination, and solar distillation. Different brands of products for filtration and disinfection are also compared. Importantly, the fact sheet on safe water storage explains how to avoid recontamination.

2. Enger, K. S. , K. L. Nelson, J. B. Rose, J. N.S. Eisenberg. 2013. The joint effects of efficacy and compliance: A study of household water treatment effectiveness against childhood diarrhea. *Water Research* 47 (3), 1 March 2013, pg. 1181–1190.

<http://www.sciencedirect.com/science/article/pii/S0043135412008469> Accessed 10 Dec 2013.

This study seeks to quantitatively measure how effectively water treatment decreases the incidence of diarrhea in children when both the efficacy of the water treatment technique itself and the community members' commitment to implementing it are considered. In places where the water is highly contaminated, full compliance with the water treatment strategy can reduce exposure to pathogens significantly. Even the best water treatment techniques cannot prevent as many cases of diarrhea when some of the water people drink is untreated.

3. NCDD (National Committee for Democratic Development). 2013. NCDD Database. Available at: <http://www.ncdd.gov.kh/en/national-program>. Accessed 10 Dec 2013.

This is the Royal Government of Cambodia's page for the National Program for Sub-National Democratic Development. It outlines goals for reform in the next ten years that center on increasing accountability to the citizens through local participation in the development agenda, improving public services and infrastructure, and reducing poverty. Links are available to download the full text of the plan in Khmer and English.

4. United Nations News Centre. 2012. World meets goal of boosting access to clean water but lags on better sanitation – UN:

<http://www.un.org/apps/news/story.asp?NewsID=41465&Cr=MDGs&Cr1>. Accessed 10 Dec 2013.

This United Nations article from March 2012 cautiously celebrates reaching the goal of halving the proportion of people without access to clean water ahead of the 2015 target deadline established in the Millennium Development Goals. Over two billion more people had access to clean water in 2010 than in 1990. However, 11 percent of the world's population still lacks clean drinking water. The state of sanitation has not improved as dramatically; with access to improved sanitation for just 63% of the world's population, it remains far from the goal of 75% by 2015.

5. WfC (Water for Cambodia). 2013. <http://www.waterforcambodia.org>. Accessed 10 Dec 2013.

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This is the homepage for the Water for Cambodia organization. Information about the history of WfC's projects and more photos and diagrams explaining the design and efficacy of the biosand filters discussed in Chapter 4 are available here.

6. WHO (World Health Organization). 2013. Water Sanitation and Health: Health through safe drinking water and basic sanitation:

http://www.who.int/water_sanitation_health/mdg1/en/index.html. Accessed 10 Dec 2013.

--- 2007. Household water treatment and safe storage: treatment technologies.

http://www.who.int/household_water/research/technologies_intro/en/index.html. Accessed 10 Dec 2013.

The first site defines the terminology used in the Millennium Development Goals regarding access to safe drinking water and basic sanitation. It goes on to explain how improving access to safe drinking water will support the achievement of the other Millennium Development Goals. It also covers some of the obstacles in the way of achieving the goals, highlights what the World Health Organization is doing to help facilitate progress, and shows projections of progress toward the target in the coming years. The second site evaluates several options for treatment and storage of household water. It looks at how cost and complexity factor into the accessibility of resources. Local conditions also determine how well particular methods will work. Finally, the site calls for further study of the efficacy of each method and the practicality of implementing it.

7. WHO(World Health Organization)/UNICEF. 2012. Progress on Drinking Water and Sanitation: 2012 Update. WHO/UNICEF Joint Monitoring Programme for Water Supply and Sanitation. http://www.who.int/water_sanitation_health/publications/2012/jmp_report/en/. Accessed 10 Dec 2013.

This site provides an outline of the 2012 update on Progress on Drinking Water and Sanitation document as well as links to download the full text. These updates, which are published biannually, report on the degree of progress toward the targets established in the Millennium Development Goals. This update covers both positive news, such as the early achievement of the clean water target and a reduction of disparities between urban and rural populations, and areas of weakness that remain priorities for improving public health, such as addressing the continued lack of access to clean water still facing 780 million people and the slow progress toward improving sanitation.