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## Cuba's Water Crisis: Coping With Water Scarcity in Havana and Santiago de Cuba

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## College of Liberal Arts

## Department of Anthropology



# Cuba's Water Crisis: Coping With Water Scarcity in Havana and Santiago de Cuba

by Jacqueline Gilbert

May, 2017

*Based on IRB-approved research, this essay is the culmination of an independently-designed, IROP-supported project that was accompanied by an independent study (ANTH797 Reading and Research) with Prof. Robin Sheriff in Spring 2016.*

Cuba, like many islands of the Caribbean, struggles to maintain water security in a rapidly changing climate. Sea level rise, changes in precipitation, and warming temperatures have presented new difficulties to an island that is already geographically challenged in terms of access to fresh water. In addition, there are numerous political, social, and economic causes and consequences of water scarcity that can be attributed to the particular system of water management throughout the island, to Cuba's political climate, and to its economic fragility. To cope with scarcity, the government employs a strategy of rationing water in urban areas, oftentimes forcing city dwellers to find ways to cope with infrequent water deliveries. While conducting research on the impacts of water scarcity on the people in Havana and Santiago during the summer of 2016,<sup>[1]</sup> I learned that the distribution of this key resource offers many clues to understanding Cuban society at a time of economic fragility and political change.



*A contaminated spring in Santiago de Cuba where locals gather water for cleaning and bathing.*

Stark discrepancies can be observed in the distribution of water in Havana and Santiago de Cuba. In the worst of cases, households must wait several weeks for water to be available via the underground aqueduct, and many people struggle to devise mechanisms for storing enough of it. At the same time, there are neighborhoods that enjoy continuous access to water from the tap. Indeed, water saving and overconsumption can be observed simultaneously from one household to the next. One day I was walking with a Cuban friend through a neighborhood just outside of downtown Santiago de Cuba. As the sun was setting we headed down a steep hill towards the city center, passing by families who were pushing 55-gallon tanks and buckets filled with water up the same steep hill on carts. My friend thought it would be interesting for me to see the local *manantial* (spring) when many people get out of work and dedicate their evenings to filling up their water stores and cleaning their homes. Dozens of people were filling containers and washing their motorcycles with contaminated water that gushed out of a plastic pipe next to the sidewalk. According to my friend, the city government had made several attempts to close off the spring by covering it with cement due to toxic levels of sewage and chemicals, but the locals had reopened it several times out of desperation.

Continuing along the same street, we saw water overflowing out of the rooftop cistern of a two-story home and into the street. My informant speculated that the people living in the house must have forgotten to turn off their pump that fills the cistern when water is being delivered via the aqueduct. He said, "Amazing isn't it? You have all of these people hauling contaminated water from the spring just so they can wash their clothes and then this guy has so much water that it's spilling into the street. You see this everywhere, some people have too much water and others, they don't have any." As I was to discover over several weeks of interviews, the reason for the enormous variation in people's access to water in Cuba's urban centers was a complex web of factors that includes inequalities already baked into the system since before the revolution, those emerging out of the booming tourism industry, and pure luck.

Drawing on data I collected during 10 weeks of fieldwork in Cuba, this paper outlines the most important causes of water scarcity on the island, describes the government's strategy of managing and conserving water resources, and offers insights into the social consequences of inequitable access. While agriculture is the biggest consumer of water, followed by industry, these topics are outside of the scope of my research. My focus is primarily on residential water consumption and management, and I approach these issues with an ethnographic perspective.

## Methodology

To develop an adequate understanding of Cuba's particular situation with regard to water scarcity and water management using qualitative research methods, I spent 10 weeks primarily in Havana and Santiago de Cuba engaging in interviews and participant observation and assessing the Cuban literature related to water. I interviewed 19 professionals with expertise in the topics of resource management and environmental conservation.[2] I used a standard set of questions but modified them depending on participants' professional roles in water management. I also engaged in informal discussions with over 40 ordinary Cubans[3] in order to learn about the social impacts of poor water access and of state-led water management. Every participant, whether during interviews or casual conversations, was asked how often and for how long they receive water from the aqueduct (i.e. the underground distribution network), how much and what type of storage they use (or need) to get their household through the cycle, and how much water they estimated themselves to use per day. Participant observation, additionally, gave me insight as to how people store, conserve, and use water in the home.

During my fieldwork, I would sometimes get drastically different answers to the same question depending on whom I asked. Freedom of speech has yet to be fully realized in Cuba and people are inclined to avoid political conversations, fearing retribution from the government. Therefore, it was difficult to cross check the accuracy of any information, or the sincerity of any opinion. In order to reduce bias and to accurately reflect Cuba's experience with regard to water scarcity and management, I sought the opinions of a broad range of participants with diverse backgrounds, expertise, and interests. To protect my informants, I gave them complete anonymity.

In Havana, I spent a considerable amount of time walking around the city and observing water deliveries via tanker trucks (*pipas*), which would indicate that the underground distribution system in a particular neighborhood was under repair. From my observations, I was able to get an idea of which neighborhoods and municipalities were experiencing infrequent water deliveries or interruptions in service. I also visited three low-income communities in order to understand how people manage/store water when access is infrequent,[4] and where they obtain water after exhausting backup supplies.

## Causes of Water Scarcity

Cuba's looming water crisis has developed out of a variety of environmental, social, and political factors. According to government institutions,[5] natural environmental factors (e.g. geography) and climate change are the principle causes of scarcity. In addition to the obvious challenges Cuba faces as an island nation,[6] most of its rivers run north to south, thereby

quickly carrying surface water from reservoirs in the center of the island to the sea because of its long and narrow shape.[7] Furthermore, managing drastic fluctuations in precipitation in the Caribbean requires sophisticated planning and adequate storage. Climate change complicates things even more; Cuba's most important aquifers, situated along the coast, are under threat of saltwater intrusion with rising sea levels,[8] and there has been a significant decrease in yearly precipitation averages since 2010 according to national data.[9] The year 2015, the second year of Cuba's longest drought in history, was also the driest in history with the precipitation average at 77% of the historical average.[10] Average intervals between droughts have decreased from 20 years to 5 years over the past century.[11]

While Cuba is relatively well endowed with surface and groundwater resources, infrastructure throughout the island is underdeveloped if not in complete disrepair, resulting in massive water losses. The aqueducts serving Havana leak at least 60 percent of the water that passes through them.[12] This can be observed throughout the city – the streets are often covered with water leaking out of pipes or out of people's homes. In addition, wastewater infrastructure is very underdeveloped, and water that could be recaptured and treated for redistribution is oftentimes dumped into the sea.[13]

In order to maximize the island's water potential, the national government tends to emphasize massive engineering projects[14] that alter the natural hydrological system. Several scientists I interviewed criticized this approach, saying that given the ecological consequences of damming water and moving it from one region to another, resources would be better spent on fixing the systems already in place. In other words, if the government channeled the same amount of money into minimizing losses, improving wastewater treatment, reforestation, rebuilding ecosystems, and innovating methods of irrigation, there would be no need to continue to drastically transform the natural environment to serve the needs of the population.[15] Mismanagement of resources is the principle driver of water scarcity in Cuba according to many independent researchers.[16]

Despite my emphasis on intermittent access to water in Cuba, overconsumption is another cause of scarcity. From what I observed, people do not make a habit of using water carefully when they have 24-hour access. This is, in my opinion, due to the fact that the majority of residents pay less than one Cuban peso[17] per person per month. This rate is consistent throughout the year regardless of how much water a household uses, so people are not incentivized to conserve. As a result, Cubans oftentimes neglect to fix leaky pipes and faucets inside the home because the materials are too expensive and they do not have to pay for the losses. Culturally, one is encouraged to take multiple showers a day.[18] My research subjects described a societal preference for cleanliness, especially in Cuba's unbearably hot and humid weather.[19] Cleaning the house is also very water intensive; most families I encountered in my fieldwork mopped their floors with 5 or 6 buckets of water at least once per week.

While average water use per person is around 200 liters per day,[20] there is a significant proportion of people with too little water and just as many at the other end of the spectrum using as much as 350 liters[21] of water per day. Overconsumption and water waste may soon be reined in as water infrastructure in Havana is rehabilitated and as meters that charge people according to the consumption are slowly being installed.[22] The government has also made a concerted effort to educate the population about the water crisis; environmental conservation is emphasized in early education, newspapers thoroughly cover the drought, and PSAs appear on Cuban television daily asking citizens to do their part. However, in my interviews many people expressed frustration when I asked them about overconsumption. One person asked me how I could talk about overconsumption when there is water leaking out of pipes constantly – “why should people change their routines if the government is not holding up its end of the deal?” In addition, water access is inequitable and arguably unfair. Overconsumption is only a problem in households where water is continuously accessible. The complexity of the situation, then, requires that the issue of water scarcity be approached from multiple angles.

As I have described, water scarcity exists in Cuba because of an array of environmental, social, economic and political factors. While the Cuban government has made huge gains in increasing Cuba's hydraulic potential,[23] achieving a water supply that

meets the demand requires resources that the government doesn't necessarily have. Even if money were not an issue, problems such as mismanagement, waste and overconsumption would persist.

## Water Management in Cuba

In 1963, Fidel Castro famously declared, "Ni una gota de agua se vaya al mar" ("not a drop of water reaches the sea"), referring to his plan to transform the island's hydrological system so that surface water would not continue to be lost to the ocean and so that rainwater from tropical storms would be harvested on a large scale. This declaration of water as a new priority of the socialist government followed the devastation of Hurricane Flora in 1963.[24] The Voluntad Hidráulico, as the initiative is called, has resulted in the construction of over 200 dams and reservoirs, and in the establishment of the National Institute of Hydraulic Resources (INRH), the government institution in charge of research and management of the island's water resources.[25]

While the INRH oversees hydraulic engineering and water management at the national level, municipal utility companies serve the major urban areas under their supervision. Institutions (e.g. hospitals, schools, etc.), industries (e.g. factories) and government-owned businesses submit an annual request to INRH detailing how much water they will need for the year in order to operate successfully, which they are almost always granted without scrutiny.[26] While this method doesn't encourage government entities to use water more efficiently, it does allow INRH to keep close track of the demand and to plan accordingly.[27] Municipal water companies[28] are then in charge of allocating water based on the needs of these government entities, as well as distributing as much water as possible to the population without depleting the island's reserves. They are, therefore, responsible for devising the system of rationing.

In Havana, residential water distribution ranges from continuous to every few days when the system is functioning properly. Santiago, on the other hand, has much greater variability of access with cycles ranging from continuous to every 30 days, because physical water scarcity is more severe in the eastern half of the island.[29] If no storage system is in place, residents can only access water from the tap for the scheduled hours. Based on my interviews, the scheme for water rationing in urban areas is incredibly complex[30] and (unintentionally) results in winners and losers.

To complicate things further, the crumbling infrastructure results in many interruptions in service; several interviewees cited the lengthy repairs as one of the most frustrating aspects of centralized resource management. When piping networks are broken or malfunctioning, part of the distribution network needs to be turned off and affected households are served by a free water delivery service via *pipas*. [31] Oftentimes *pipas* do not have a set schedule, so no one can be sure of the specific time of day when water will come. Getting the water from the *pipa* to the home can be complicated and time consuming; if there is no cistern connected to the apartment building or house, residents oftentimes must haul water in buckets and somehow store enough to hold them over until the next delivery. [32] Because *pipas* do not stop at every single block, some people have to walk several blocks with full buckets of water.

To avoid the hassle, people sometimes offer bribes to the driver so he will make a stop directly in front of their homes. Bribes are also offered in order to get extra deliveries when residents become desperate. This is illegal and if caught, the driver would face a serious fine. I oftentimes stumbled upon illegal late night water deliveries in Old Havana, where the aqueduct is under near-





constant repair. This informal water market is “common knowledge,” meaning everyone I spoke to was aware of it. It is especially common for households that operate *casas particulares* (bed and breakfasts) out of their homes to purchase extra water deliveries in order to meet the demand of their foreign guests. For the average Cuban,[33] however, the going rate for large amounts of water in the black market is out of reach.

Whether the aqueduct is working or not, homes rarely have uninterrupted access to water, with the exception of some of the busier streets with many important businesses and government ministries. When service is interrupted for extended periods of time, citizens are notified via the local news channel or by their local delegate. Residents may also air water-related complaints to these neighborhood delegates who are then responsible for channeling grievances to a higher official. There are two local governing bodies that citizens can access to inquire about water-related problems: *Comités de Defensa de la Revolución* (CDRs), which serve a single city block, and the *Poder Popular*[34] *Circunscripción*, which represents several city blocks. All delegates within CDRs and *Poder Popular* are elected annually to represent the citizens. With regards to service, then, the purpose of these neighborhood organizations is to relay information between citizens and the higher assemblies of *Poder Popular* regarding problems in the community, complaints, delinquency, and basic service provision.[35]

Local governance is highly democratic and participatory, and, according to the majority of my subjects, has the best interest of the people in mind. However, it doesn't actually translate to genuine public participation in decision making over scarce water resources. The Party (a separate governing body from *Poder Popular*) ultimately rules in decision-making. Projects and initiative aiming to improve basic service provision and to alleviate water scarcity often hit a wall due to lack of resources available to *Poder Popular*, even at the highest levels.

All in all, water provision in Cuba is highly centralized. A state controlled system of natural resource management has the potential to benefit society because it is not profit-driven and, when combined with the recognition of water as a human right, it ideally would prioritize the needs of the population. Additionally, centralized resource management allows for adequate oversight, which can be advantageous, for example, when it comes to thoroughly researching environmental conditions and collecting data on the availability of natural resources. However, much inefficiency exists within water management and while there are systems in place for residents to participate (e.g. to air complaints, provide input and feedback, and to make requests) they are highly bureaucratic and oftentimes ineffective.

## Inequitable Water Access

Water rationing in Cuba works to regulate and limit consumption by strategically distributing water in (ideally) fixed cycles. It serves an important function by allowing the INRH to keep close track of how much water is leaving the reservoirs and rivers. In that sense, it is a tool that helps the government maintain supervision over consumption and project future demand and supply. However, rationing places the responsibility for storing water and managing it between deliveries upon citizens themselves. In other words, the time period between delivery cycles is usually long enough that families must find some way of accessing water in the meantime. Inequities result, in part, because some people have more resources than others and are able to increase their storage capacity by building cisterns and buying tanks and pumps. In addition, some households just happen to be



After receiving a water delivery from a tanker truck in Old Havana, local residents must move their water tanks upstairs

located in areas that receive water more frequently than *into their apartments*.  
neighboring zones.

The sophistication of a particular family's strategy of storing water between cycles depends primarily on the financial resources they have at their disposal. Some households I visited, especially those in Santiago, relied solely on uncovered buckets of water resting on the floor. Conversely, the homes that I stayed in had giant cisterns or numerous 55-gallon tanks on the roof, storing more than enough water to tide them over until the aqueduct was running again. Installing these larger storage systems ranges in cost from \$300 to \$1000. Given that Cubans typically earn between \$25 and \$40 per month on a government-issued salary, implementing a complex structure for storing water is not feasible for all. My informants who were able to afford to upgrade their plumbing and storage did so with the help of extra income (i.e. income in addition to a government salary), especially from remittances, work in the informal economy, tips, and foreign money coming from tourism. My research advisors, for example, had cisterns because they all worked abroad in academic and journalistic capacities, and used the money they earned to invest in their homes.

Having inadequate access to water puts some people at a huge disadvantage. To understand the ways in which ordinary Cubans cope with sporadic and infrequent water deliveries, I surveyed water distribution and consumption patterns in several low-income communities. In Old Havana, I visited a large apartment complex several times over three months to keep track of how long this particular community had been disconnected from the aqueduct. For at least four months, this 4-story building that housed over 50 families was receiving water via pipa truck deliveries because the system was under repair. I noticed the building for the first time when I saw families hauling buckets of water from the truck and up the stairs into their apartments. I befriended a woman named Laura (a pseudonym) who lived in this building and was fortunate enough to spend time in her home, interviewing her about her water access and consumption. As we entered her building for the first time, Laura said to me, "this is where the poor Cubans live," and explained that behind each door were small, studio-sized apartments in which entire families lived.

On average, Laura used about 18 gallons of water per day during the time that the building received deliveries via pipas.[36] The *minimum* water requirement for domestic use established by the WHO is 13 gallons per person per day.[37] Americans, comparatively, consume around 100 gallons per day. She supposed that her situation wasn't as dire as other families in the building who had to share the same amount of water between more people. However, she missed deliveries more often than her neighbors because sometimes both she and her daughter would be out working when the pipa arrived. When this happened, she would either have to ask a friend in the building for help or go out and buy water. Laura described her experience with water access as incredibly frustrating; she wasn't able to keep her house as clean as she would like, she had to take sponge baths because there was no running water, and she experienced physical discomfort from carrying water in buckets due to her severe arthritis. A week before I departed, I visited Laura one last time and was thrilled to hear that the repairs had been completed and she was now able to use her faucet every other day for four hours per day.

While Laura's struggles with water access were, from her perspective, temporary, another community I visited located in Santiago had a more permanent relationship with infrequent water deliveries. In this particular location, water access is a challenge because families occupy a dozen or so small one-room apartments in what used to be a brothel before the revolution. Since this apartment complex was never intended to house families of three or four, it was not constructed to store water-- several units do not even have running water or toilets. The distribution cycle in this



neighborhood is 24 hours of continuous supply every 20-23 days. In the intervening time, water is stored in 55-gallon tanks that sit in the walkway outside of each apartment. Space is limited, so each family must share a tank with others. . In some of the units I observed, residents had filled every container they could find with water.

One informant estimated that a 55-gallon tank could support a family of six for three days at the most, if they used the water strategically. Some ways that these families reuse water include washing the floors with the same water that was used to wash clothes and flushing the toilet with the same water that was used to clean the rice. After they run out, they must go looking for water, which can take hours. Using a cart, the men in this neighborhood roll their larger tanks or haul buckets to a nearby well (almost one hour round trip) where they can illegally purchase water. The people I spoke with in this community said that the most frustrating aspects of their situation were paying for water, spending a significant amount of time finding water, and feeling dirty because they cannot properly clean themselves or their home. Being dirty or smelly, they stressed, was embarrassing and inappropriate.



*These 55-gallon tanks are shared by multiple families in this crowded neighborhood in Santiago de Cuba, where water arrives via the aqueduct every 20-23 days.*

Citizens who do not have 24-hour access to water cannot open a number of businesses out of their home. Many Cubans sell coffee, fresh juice, pizza, sandwiches and other snacks and refreshments from home, which of course requires water. The most lucrative private businesses – family restaurants (*paladares*) and *casas particulares* – are water intensive and legally responsible for providing 24-hour access. Therefore, those with unlimited access to water in Cuba are not only freed up from having to spend hours accessing and storing and strategically using water, but they have more economic opportunities. Not to mention, they can sell water to their neighbors in need. Water, then, becomes a resource that reproduces and potentially intensifies inequality. However, it is, in part, the inequity of access to water that helps to limit consumption on a large scale – if everyone in Cuba could afford sophisticated storage systems that eliminate the need to conserve, rationing would not serve the purpose of decreasing consumption. Therefore, water rationing works successfully only when there is a large proportion of people who cannot easily find a way around it.

## Conclusion

Cuba's socialist model of governance has helped the island achieve relatively high coverage of basic services.[38] In addition to prioritizing environmental research and education, centralization has facilitated a high level of coordination and collaboration between institutions.

However, the Cuban government's ability to provide reliable basic services to its population of over 11 million has been stifled by political factors, such as the U.S. trade embargo, by natural forces, such as accelerating climate change, and by the mismanagement of water resources, among other causes.

Water rationing as a strategy to conserve Cuba's limited water resources inadvertently results in inequitable water access because those who can earn or receive foreign money (especially in US dollars) can find ways to achieve 24/7 access to water while others cannot. In many cases, the causes of inequitable water access can be traced back to before the revolution and then are reinforced when rationing is introduced. For example, Cubans typically inherit their homes from their parents, so infrastructural advantages and disadvantages are passed down. The island's economic fragility is such that it is nearly impossible to get ahead without receiving extra money from remittances or from tourism; however, several of the ways that one can access tourism would require adequate access to water. In sum, inequitable water access makes it difficult for Cubans with fewer economic opportunities to improve their quality of life.

Understanding water management and water consumption in Cuba is useful in many ways. A lot can be learned from the socialist government in terms of environmental conservation—Cubans have made considerable gains in research, sustainability, and environmental justice. The government also recognizes the great importance of water security and has launched a serious campaign against scarcity. However, in studying Cuba's strategies of coping with limited water

resources and the pressures of climate change, we can also learn lessons about what doesn't work. Based on my research, I am inclined to think that providing free water service contributes to the problem of waste and misuse, while water rationing worsens inequality. To be sure, these are opinions that I have developed after immersing myself in this topic for only 3 months. Further research would be required to find out if these conjectures actually, so to speak, "hold water."



A doorway mural depicts a faucet and the Cuban flag.

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- [1] My research in Cuba would not have been possible without such generous support from the UNH International Research Opportunities Program, which funded my research. I am also grateful for the intellectual, logistical, and emotional support provided by my research advisors in Cuba - Carlos Iglesias, Norma Guillard, and Reinaldo Funes – and by my academic advisor Robin Sheriff at UNH.
- [2] These experts include hydrologists, engineers, professors, geologists, geographers, and government officials working in the National Institute of Hydraulic Resources (INRH).
- [3] i.e. Cubans with no professional expertise in the subject of my research
- [4] The water delivery cycles in these communities that experienced infrequent access ranged from 3 hours two days per week to 24 hours every 23 days.
- [5] e.g. the National Institute of Water Resources
- [6] The absence of a long-term water supply means the surface and groundwater stores must rely on replenishment solely from rain.
- [7] Sergio Díaz-Briquets and Jorge Pérez-López, *Conquering Nature: The Environmental Legacy of Socialism*. Pittsburgh, PA: University of Pittsburgh Press, 1999: p. 113.
- [8] Personal communication with hydraulic engineer at CUJAE in Habana, July 4, 2016.
- [9] I accessed this data during an interview at the INRH office in Santiago de Cuba.
- [10] Personal communication, INRH office in Santiago, July 13, 2015. The national study that this participant showed me compared the precipitation averages of the past 43 years to the historical average, concluding that 2015 was the driest of the past 43 years.
- [11] Personal communication, INRH headquarters in Havana, July 5, 2016.
- [12] Personal communication, former chemical engineer at the Ministerio del Agua, June, 28, 2016.
- [13] Personal communication, former chemical engineer at the Ministerio del Agua, June, 28, 2016.
- [14] By “massive engineering projects” I am referring to large dams, pipelines that connect dams and reservoirs together, and open channels that move large amounts of water over long distances.
- [15] Personal communication, chemical engineer from an environmental research institute, June 28, 2016.
- [16] i.e. those not representing the Cuban government
- [17] One Cuban peso is equivalent to about four cents.
- [18] Every person I interviewed who had consistent access to water reported taking at least one shower per day, but on average two.

[19] I conducted an informal survey of showering habits by asking all of my participants, when appropriate, how many times per day they showered.

[20] Personal communication, INRH headquarters in Havana, July 5, 2016.

[21] To put these numbers into perspective, Americans – the highest consumers of water in the world – use, on average, 400 liters per day.

[22] Personal communication, retired manager of Aguas de la Habana, June 28, 2016. Meters cannot be used effectively until the leaks are kept under control – people would be paying for the losses.

[23] Increasing the potential could be accomplished through construction of reservoirs, dams, and desalination plants.

[24] Mercedes Arellano Acosta and Ninón Alfonso Benítez, *El Ciclón Flora: Un Hito*, La Habana, Cuba: Instituto de Hidroeconomía, 1983: page 58.

[25] Pedro Luis Dorticós del Río, “Capítulo 1: Recursos Hidráulicos Potenciales: Volúmenes. Indicadores de Disponibilidad de Recursos Hidráulicos. Estrés hídrico,” page 9 of *Los Recursos Hidráulicos en Cuba: Una Visión Estratégica, 2012*.

[26] Personal communication, engineer at INRH office in Santiago, July 15, 2016.

[27] Personal communication, engineer at INRH headquarters in Havana, July 5, 2016.

[28] Aguas de la Habana and Aguas de Santiago, for example.

[29] In addition to the climate being hotter and drier in the east, the 6 easternmost provinces from Camaguey to Guantanamo are home to half of the population of Cuba and cover almost 50% of the total land area of Cuba, but contain only 20% of the total water resources on the island.

[30] The frequency with which households can access water from the aqueduct via the tap varies greatly depending on one's particular location, the capacity of the water source that supplies that particular zone, the population size of the zone, among several other factors according to the director of distribution at Aguas de Santiago.

[31] This happens frequently in Old Havana, where systematic renovations are underway.

[32] <http://www.ipsnews.net/2015/12/water-shortages-have-a-heavy-impact-on-wo...>

[33] I am referring to those Cubans who do not have access to foreign money via cash tips or a privately owned business that foreigners utilize (in other words, Cubans who live primarily off of a government-controlled salary).

[34] Poder Popular is the term for the 4-tiered state system of government that includes the local neighborhood assemblies, all the way up to the National Assembly.

[35] I learned about local governance by talking with two elected delegates in Havana about their experiences as representative officials in CDRs, and by talking to my advisors about Cuba's political and governmental structures.

[36] I made this calculation by dividing her storage capacity by the number of days that her water delivery lasts and then divided that number by two people to account for her daughter.

[37] See 2005 WHO hierarchy of water use: [http://ec.europa.eu/echo/files/evaluation/watsan2005/annex\\_files/WHO/WHO...](http://ec.europa.eu/echo/files/evaluation/watsan2005/annex_files/WHO/WHO...)

[38] According to a retired manager of Aguas de Habana whom I interviewed, the water coverage rate is around 90%. July 28, 2016. National statistics claim it is even higher.

*The views and opinions expressed in this article are those of the author and do not imply endorsement by UNH.*

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