2016 Hawai'i Water Rates Report

HAWAII STATE DEPARTMENT OF HEALTH

UNC ENVIRONMENTAL FINANCE CENTER

About this Report

May 2017

This report details the results of a survey of water rates and rate structures in the State of Hawai'i, current as of July 2016, conducted by the Hawai'i Safe Drinking Water Branch (SDWB) at the Department of Health and the Environmental Finance Center (EFC) at the University of North Carolina at Chapel Hill. Between September and December 2016, 48 systems across the State of Hawai'i were requested to provide their water rate structures and audited financial statements for the water enterprise fund. Thirty-five systems from Hawai'i, Honolulu, Kauai, and Maui counties completed the survey.

In addition to this report, there is an accompanying set of tables that lists the water rates and rate structure details of the participating systems, and an online, interactive Water Rates Dashboard where users can compare systems across various attributes such as water system characteristics, customer demographics, and geographic location. These resources are available at http://www.efc.sog.unc.edu/Hawaii-water-rates-survey.

Acknowledgments

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2016 Hawai'i Water Rates Report:

Water Rates and Rate Structures in Hawai'i as of July 2016

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Introduction

Setting appropriate rates for water services is a critical environmental and public health responsibility, as water rates ultimately determine how much revenue a community or water provider will have to maintain vital infrastructure to serve clean drinking water to people. The purpose of this report is to help systems in rate setting by providing a detailed survey of statewide water rate structures that were current as of July 2016. This report represents a collaborative effort between the Hawai'i Safe Drinking Water Branch (SDWB) at the Department of Health and the Environmental Finance Center (EFC) at The University of North Carolina at Chapel Hill.

Over the course of this survey, 48 water systems were contacted by email and/or phone and 35 systems (73 percent) all four counties responded by sending in their water rate sheets. The 35 systems, listed in Table 1, serve approximately 1.33 million Hawai'ians and account for 89 percent of the population served by community water systems in the state.

Table 1: Systems that Participated in the July 2016 Water Rates Survey

System in the Rates Survey	Estimated Service Population	System in the Rates Survey	Estimated Service Population
Hawai'i County		**Maui County**	
		Maui County Department of Water Supply	132,318
Hawai'i County Department of Water Supply	114,197	Hawai'i Water Service Company, Inc. - Kaanapali	8,000
Hawai'i Water Service Company, Inc.*	12,360	Kapalua Water Company, LTD.	4,200
Hawaiian Beaches Water Company, Inc.	3,430	Lanai Water Company, Inc.	2,800
Kaupulehu Water Company	1,760	Hoolehua	1,900
Hawaiian Shores Community Association	1,310	Molokai Public Utilities, Inc.	1,000
Kohala Ranch	805	Keola Hana Maui, Inc.*	976
Napu'u Water, Inc.	468	Mahanalua Nui	587
Punaluu Water and Sanitation Corporation	200	Waiola O Molokai, Inc.	580
Kawaihae Unit #1	193	Kawela Plantation	160
Wood Valley Water and Farm Cooperative	75	Kahakuloa Acres Water Company	150
		Maunaolu Plantation	100
		Olowalu Water Company, Inc.	100
		Ohanui Kailua Water System	90
		Consolidated Baseyards	69
Kauai County		West Kuiaha Meadows	45
Kauai County Department of Water Supply	59,951		
Kokee State Park	2,000	**Honolulu County**	
Princeville Utilities Company, Inc.	1,698	Honolulu City and County Board of Water Supply	963,400
Kealia	260	Laie Water Company	5,577
Moloaa Irrigation Cooperative	47	Waiahole Valley	300
Koloa Water System	40	North Shore Water Company (Dillingham Ranch)	100

*System has two or more water rate structures

County Utilities vs. Other Participating Systems

All four county-owned water utilities, which serve more than 85 percent of the community water system-served population of Hawai'i, are included in this survey. The remaining systems include two state government entities, 12 not-for-profit water associations and cooperatives, and 17 for-profit water systems, as shown in Table 2. Some systems use more than one rate structure for different portions of their service areas, raising the total number of "rate structures" in our sample to 39. Many analyses in this report refer to measures of the 39 rate structures.

Table 2: Number of Participating Systems with Water Rates Data (July 2016 Rates)

Institutional Arrangement	Count	Average Service Population
For Profit	17	1,841
Not For Profit	12	251
County	4	317,467
State Government	2	1,950
Total Number of Systems	**35**	
Number of Rate Structures	***39***	

There is a distinctive size difference between the four county utilities and all of the other systems. The average service population for the state government systems and the non-governmental water systems is below 2,000 people per system (half are below 300 people per system), whereas the county utilities each serve over 59,900 people. The distinction in customer base size and institutional arrangement significantly affects the financial management, performance, and rates charged by the county utilities compared to all other systems. These distinctions are elaborated on in this report.

Three Myths about Pricing

There are many oversimplifications and bits of "conventional wisdom" in the world of water finance and pricing which do not necessarily hold up upon deeper investigation. Some of the myths dispelled by the analysis in this report include:

1. **MYTH: Higher rates are bad.** Higher rates often do not necessarily reflect poor or inefficient management. In fact, data show that some systems with low rates do not generate sufficient revenue to properly maintain their system's assets, which could ultimately lead to long-term adverse cost and service impacts. Pressure to maintain low rates has the potential to force systems to run a deficit or avoid making necessary operational and capital expenditures. Some systems may have low rates because they have not re-examined their rate structures in many years, and their pricing structure may not support key finance and policy goals such as promoting conservation.

2. **MYTH: Comparing rates is simple.** An examination of rates and rate structures will only tell part of the story, and there are many different methods of comparing pricing. Pressure to maintain low or relatively low rates has the potential to force systems to run a deficit or avoid making necessary operational and capital expenditures. Ideally, rates should reflect the cost of providing service. Cost of service depends on diverse factors including geographic location, size of treatment facilities, electrical costs, customer base, age of assets, site-specific regulatory requirements, type of water supply, and quality of source water and receiving waters. Two neighboring systems with similar customer bases may have very different costs that justify very different rate structures and rates. Therefore, policy decisions drawn from the comparative information should also consider the many other factors listed above. Furthermore, figuring out the most pertinent factors to compare can be a challenge. For example, analysis revealed that in some cases when comparing two systems, one system's rate may be higher than the other system's rate for bills in the 0 to 4,000 gallon range, but lower at 5,000 to 10,000 gallon range. Comparing rates among systems is only a starting point for a more in-depth analysis.

3. **MYTH: Pricing is simple.** Systems employ a variety of pricing structures and show wide variation in how they set base charges and design block structures. Systems have many design choices and should be thoughtful in customizing their rate structure to serve their specific needs, objectives, and priorities as they evolve in time, rather than maintaining outdated rate structures or copying their neighbor's rate structure.

Overview of Rates and Rate Structures

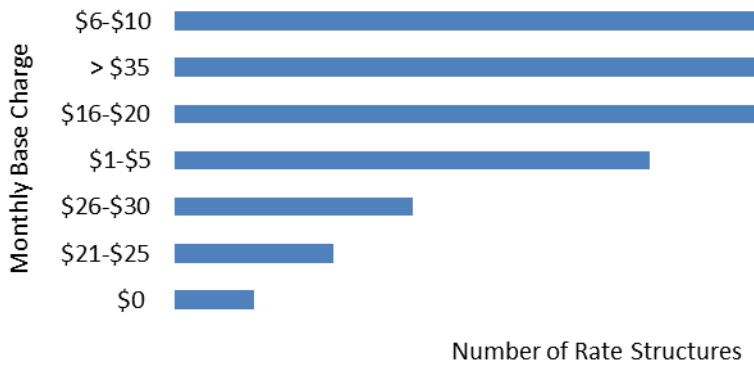
Systems employ a variety of water rate structures to determine what their customers pay. Almost all use a combination of base charges and variable charges in their rate structures. There is considerable variation in how these are calculated and how they are assessed for different classes of customers.

Base Charges

Base charges contribute to revenue stability because they do not vary from month to month, regardless of consumption. However, high base charges can create affordability concerns, and can also make it difficult for a system to encourage conservation. The range of residential base charges is shown in Figure 1, while the median[1] residential base charges by system size are presented in Table 3. Only one water rate structure out of the 39 does not include a base charge. Nine of the water rate structures charge more than $35/month for a base charge, including four charging more than $100/month ($370.20, $260, $140, and $120 per month).

The population-weighted average[2] base charge for Hawaii water customers is $11.57/month, reflecting what a typical (or "average") customer in Hawai'i is paying in water base charges. As shown in Table 3, the smallest water systems charge the highest base charges in the state, whereas larger water systems typically charge lower base charges because of the stability of their larger revenue stream. Smaller systems may, on average, have less stable customer consumption and therefore decide to shift a greater portion of their operating costs into the base charge. In fact, the four systems charging more than $100/month as a base charge for water are all very small water systems with service populations less than 100 individuals. By comparison, the four county systems charge between $9.26 and $19.25.

Figure 1: Monthly Base Charges for Residential Customers Among 39 Water Rate Structures



[1] Many of the statistics cited in this report refer to *medians*. Exactly half of the rate structures in the sample have a value that is equal to or greater than (or equal to or lower than) the median value. The median is may be preferred over the average because averages are influenced by exceptionally high or low values whereas medians are not.

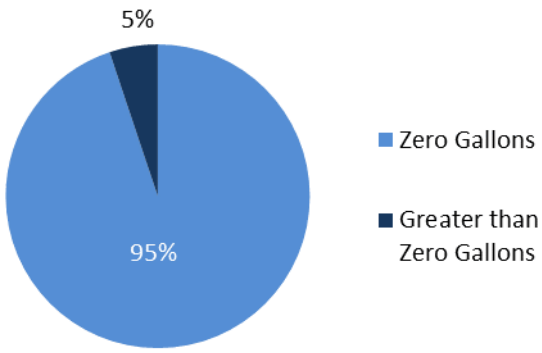
[2] The *weighted average* statistics in this report reflect what a typical water customer in Hawai'i is paying. Weighted averages are calculated by multiplying each system's charge by the service population of the system (calculating the total charges across all customers), and dividing by the total service population across all systems, producing the population-weighted average across the state.

Table 3: Monthly Residential Base Charges in Water Rate Structures, by System Size

Size of System (Service Population)	Total Number of Rate Structures	Number with Base Charge	Median Monthly Water Base Charge
1 – 100	9	9	$50.00
101 – 500	9	8	$17.40
501 – 1,000	5	5	$19.35
1,001 – 5,000	8	8	$5.83
5,001 – 20,000	4	4	$8.54
>20,000	4	4	$17.58
All Rate Structures	***39***	***38***	

While a large number of residential rate structures in other states include a minimum amount of water consumption with the base charge, only two systems in Hawai'i, servicing just 335 people combined, have a consumption allowance (see Figure 2). For these systems, the variable portion of the rate structure only takes effect when a customer uses more than the minimum included in the base charge. Thus, all customers of these systems who consume an amount up to the minimum allocation would receive the same bill, which is equal to the base charge. The consumption allowances for these two systems are 10,000 and 5,000 gallons/month, charging $370.20/month and $50/month, respectively, for these consumption allowances.

Figure 2: Consumption included with Base Charge for Residential Customers Among 38 Water Rate Structures



A large number of systems vary the base charges by the customer's water meter size in order to distinguish large commercial and industrial users from residential and small commercial customers. Of the 39 water rate structures applied to commercial and non-residential customers, 24 (62 percent) vary the base charge by meter size.

Variable Charges: Uniform and Increasing Block Rate Structures

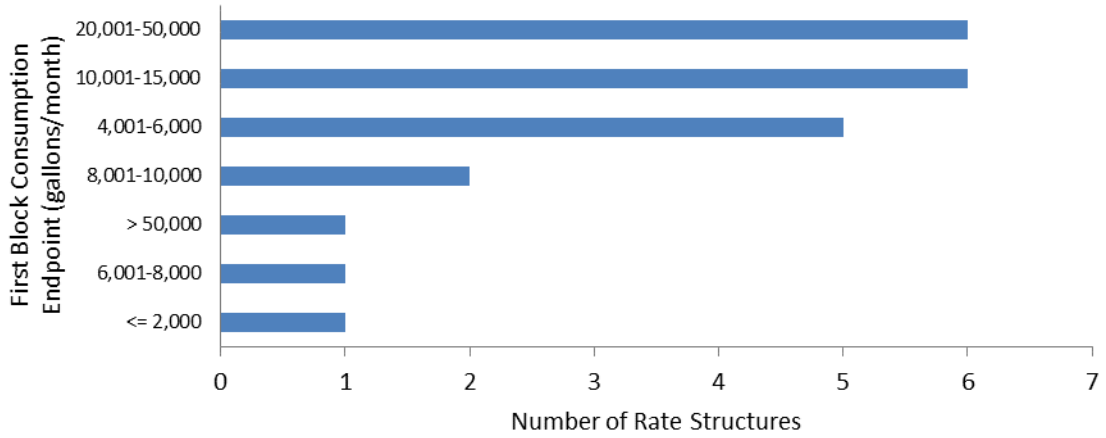
Above the base charge (and its consumption allowance), customers pay variable charges, based on how much water they use during their billing period. These variable charges provide a price incentive to customers to avoid wasting water.

Systems structure these variable charges one of three ways in Hawai'i: uniform rates, increasing block rates, and decreasing block rates. In a uniform rate structure, the unit rate at which water is charged does not change as

the customer uses more water. In an increasing block structure, the unit rate increases with greater water consumption. This structure is often employed by systems that want to encourage conservation. In a decreasing block rate structure, the unit rate decreases as consumption rises. This structure might be used to encourage economic development.

Most water systems use the same rate structure type for residential and commercial customers. While some systems design separate rate structures for commercial users, other systems use only one rate structure but design their block structure rates to inherently distinguish residential use from that of large commercial customers. A common practice is to set the first block in a block rate structure high enough to essentially charge all residential consumption at one rate (effectively a uniform rate), while consumption for most large commercial customers will typically exceed the first block, thus charging an increasing or decreasing block rate. These are referred to in this report as implied uniform rate structures for residential customers. Figure 3 shows how many rate structures include various amounts of water consumption and wastewater disposal in the first block of their residential block rate structure.

Figure 3: Maximum Quantity in the First Block Among 22 Water Residential Block Rate Structures



For the purposes of this analysis, systems with increasing or decreasing block rate structures and a first block consumption endpoint greater than 15,000 gallons per month are defined as implied uniform. Figure 4 shows that, for residential customers in Hawai'i, uniform rates and implied uniform rate structures are the most common across systems. Not surprisingly, they are the simplest variable rate structure design to implement. However, the four county utilities all use increasing block rate structures for their residential customers, incentivizing water use efficiency. In this survey, six water systems (15 percent) have a separate rate structure type for their commercial customers—five increasing block and one uniform rate structure (as shown in Figure 6), while the other systems use the same rate structure type that applies to residential customers.

Figure 4: Residential Water Rate Structures (n = 39)

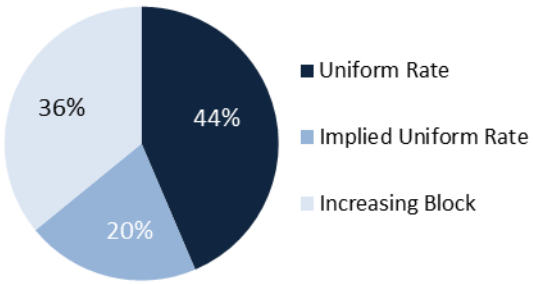


Figure 6 shows that most commercial rate structures in this sample are increasing block rates. Three out of the four county utilities use increasing block rates for commercial customers, while the other uses a uniform rate structure.

Figure 5: Commercial-specific Water Rate Structures (n=6)

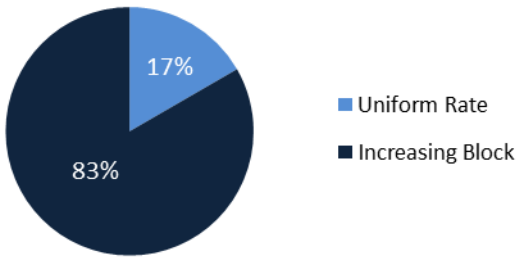


Figure 6: Commercial-specific and Non-specific Water Rate Structures (n=39)

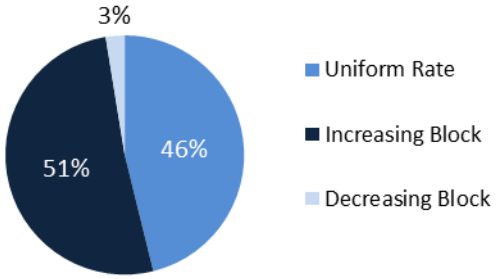
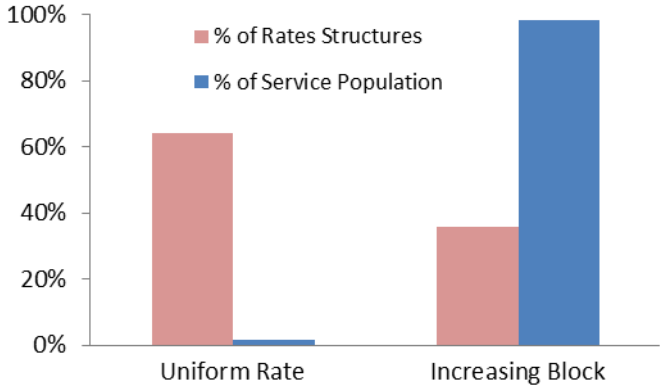


Figure 7 shows the percent of the population served under each rate structure. In this graph, implied uniform rate structures are categorized as uniform rate structures for simplicity. While only 36 percent of residential water rate structures increasing block structures through 15,000 gallons/month, 98 percent of all residential customers in this survey are served by these rate structures, largely due to the four county utilities that use increasing block rates for residential customers.

Figure 7: Water Rate Structures Applicable to Residential Consumption up to 15,000 gallons/month (n = 39)



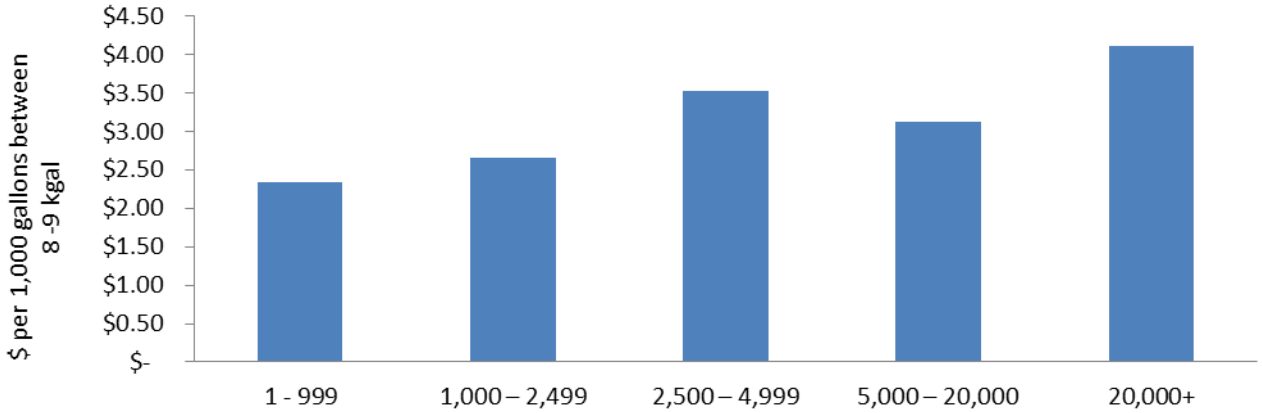
Based on an average household size of three[3] and a daily per-person consumption of about 100 gallons of water[4], customers in Hawai'i consume an average of around 8,000 to 9,000 gallons/month. For rate structures that include volumetric consumption, the variable rate that is charged at 8,000 gallons for the next 1,000 gallons is between $0.35 and $17.75 per 1,000 gallons. The weighted average price for the next 1,000 gallons at 8,000 gallons per month is $4.29 per 1,000 gallons, reflecting what the typical residential customer in Hawai'i is paying in variable charges at around the average consumption level. Most rate structures charge between $1.37 and $4.42 per 1,000 gallons, and these prices clearly vary by system size as shown in Figure 8. This figure shows a clear trend indicating that the median marginal price of water at 8,000 gallons increases as the size of the system increases. This trend is consistent across other consumption levels as well, and demonstrates that systems with larger service populations in

[3] 2011-2015 ACS 5-Year Estimates (US Census)

[4] Based on the lower end of a consumption range estimated by the Hawai'i Department of Land and Natural Resources of 100-200 gallons per person per day.

Hawai'i tend to have higher volumetric rates than systems with smaller service populations. This shows that systems with small service populations, compared to systems with larger service populations, are relying proportionally less on volumetric rates for revenue generation.

Figure 8: Median Marginal Price for the Next 1,000 Gallons at 8,000 gallons/month for 39 Water Rate Structures



Some systems provide the option to residential customers to install separate irrigation meters to supply their outdoor water usage. In some cases, the systems have created a separate, unique rate structure specifically for these irrigation meters. In our sample of 39 water rate structures, only 2 (5 percent) had a unique rate structure for residential irrigation meters. Both these irrigation-specific rate structures use a uniform rate structure design.

Automatic Power Cost Adjustment

Automatic power cost adjustments (APCA) contribute to revenue stability for water systems in Hawai'i, where electricity costs are much higher than those in the contiguous states. An APCA allows a system to recoup the electricity costs associated with delivering water to its customers. Each billing period, systems with an APCA determine the change in the cost of electricity per unit volume of water sold over a baseline. The baseline is set at the time at which the APCA is established, meaning if the cost of electricity per unit of water is more than the baseline, the customer is charged the difference. For example, if the baseline for electricity is set at $0.39 per kilowatt hour and the price of electricity is currently $0.42 per kilowatt hour, the system will charge the customer more for the current billing period based on a set APCA calculation method. An example APCA calculation is as follows:

1. *Electricity cost for current month: $13,000.*
2. *kWh used for current month: 31,000.*
3. *Electricity cost per kWh: $0.4194.*
4. *Baseline electricity cost set upon approval of APCA: $0.3907.*
5. *Increase (decrease) in cost per kWh: $0.0287.*
6. *Electricity cost to be recovered with APCA: 31,000 kWh * $0.0287 / kWh = $889.7.*
7. *Current month water sales in thousands of gallons: 6,300.*
8. *Electric Cost to be recovered per 1000 gallons: $889.7 / 6,300 gallons = $0.1413 per thousand gallons.*

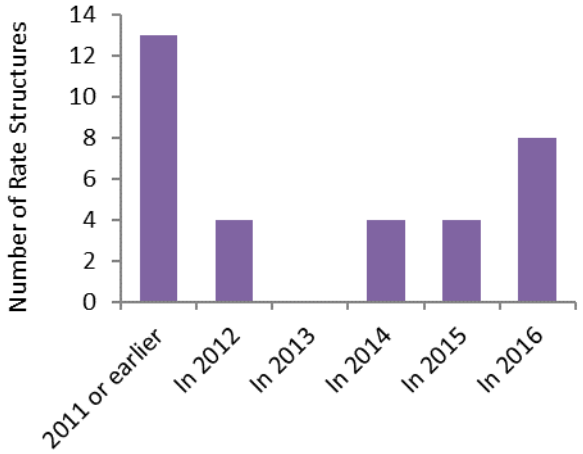
9. *Gross Revenue Conversion Factor: (1 / (1 – 0.06385)) = 1.068205*
10. *APCA per thousand gallons: (1.068205 * $0.1413) = $0.1509*

Twelve of the 39 participating rate structures (31 percent) have an automatic power cost adjustment. Eleven of the 12 rate structures with an APCA reported the value of the APCA as of September 2016. For these systems, the APCA has been included in all bill calculations and analysis. The minimum APCA was a credit to the customer of $0.36 per thousand gallons, while the maximum was an additional charge of $5.08 per thousand gallons. Comparison of the APCAs among rate structures must be done with caution, as each system has a different electricity cost set as their baseline and each system produces water in different geographic contexts which may or may not require notable electricity use associated with pumping. Additionally, electricity costs vary significantly in Hawai'i among the islands, and for the different fuel types used for power generation. For these reasons, it would be misleading to report a median, average, or weighted average APCA across the 39 rate structures.

Changes in Residential Rate Structures

Many Hawai'i systems actively evaluate and modify their rate structures every few years. Of the 39 rate structures in this survey, 33 provided the date the rates first became effective. Figure 9 shows that 16 (48 percent) have changed their rates in the last three years, including all four county utilities. In contrast, there were 13 (39 percent) rate structures that were instated prior to 2011 (rates have not changed in over 5 years). Nine of these 13 became effective greater than 10 years ago, including three systems that serve over 1,000 people.

Figure 9: In What Calendar Year Were the Current Rate Structures First Instated? (n=33)



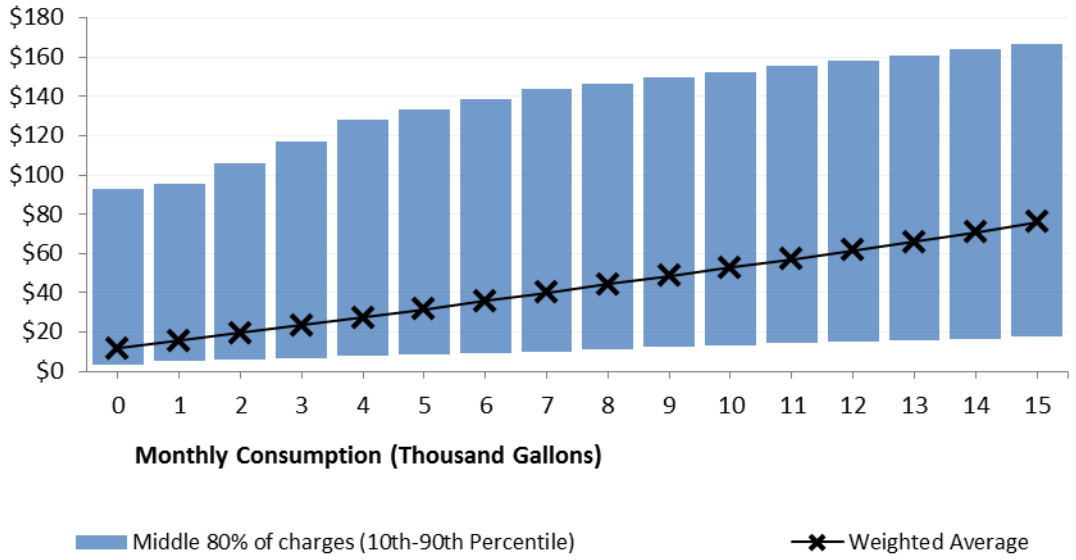
How Much are Customers Paying?

How much customers pay on their water bills depends on the base charge and the variable charge that are set by their system, and on the volume of water they consume. Customers have some control over how much they pay in water bills to the extent that they can adjust how much water they use above the consumption allowance included in the base charge.

Residential Water Bills

Figure 10 shows the ranges of how much systems in Hawai'i charge their residential customers based on different consumption levels, including the base and variable charges[5]. The colored bars highlight what the middle 80 percent of systems charge (between the 10th and 90th percentile), while the black line indicates the weighted average across all systems.

Figure 10: Monthly-Equivalent Residential Water Bills by Consumption (n=39)



The weighted average monthly water bill for zero gallons of water (i.e. base charge only) is $11.57. At near the average consumption level of 8,000 gallons, the weighted average monthly water bill is $44.27; this is the amount the typical Hawai'i residential customer is paying in monthly water bills. For a high level of consumption of 15,000 gallons, the weighted average water bill is $75.79 per month. As a point of comparison, a gallon of potable water at a major grocery retailer is approximately $1.50, while the weighted average water bill for 8,000 gallons of tap water is approximately $0.0055 per gallon, or 271 times cheaper.

Table 4 shows that in Hawai'i, there is no clear trend between the size of a system and their water bills at 8,000 gallons. However, systems with service populations under 100 people have the highest median water bill, at

[5] For systems that bill on a non-monthly basis (bi-monthly or quarterly), charges have been calculated and presented on a monthly basis to allow for accurate comparison.

$66.61/month. The four county utilities also have relatively higher water bills than other systems. Table 4 also shows the percentage of the total water bill attributed to the base charge by system size at 8,000 gallons per month. The base charge makes up the largest portion of the water bill for the smallest systems, with the median base charge accounting for 77.3 percent of the median water bill at 8,000 gallons for systems with service populations below 100 people. Furthermore, the base charge accounts for 50 percent of the total water bill at 8,000 gallons for systems with service populations greater than between 101 and 500 people and 36.8 percent for the county utilities, the second and third largest percentages, respectively. The very small water systems are this most reliant of the base charges for revenue generation and revenue stability, while the county utilities also generate substantial revenue stability for their base charges.

Table 4: Median Water Monthly Bills at 8,000 gallons/month, by System Size

System Size (Service Population)	Number of Rate Structures	Median 8,000 gallons/month Monthly Bill	Median Base Charge	Median Percentage Attributed to Base Charge at 8,000 gallons
1 – 100	6	$66.61	$50.00	77.3%
101 – 500	12	$45.06	$17.40	50.0%
501 – 1,000	4	$55.12	$19.35	33.1%
1,001 – 5,000	9	$34.30	$5.83	33.0%
5,000 – 20,000	4	$32.19	$8.54	27.0%
20,000+	4	$42.99	$17.58	36.8%
All Rate Structures	***39***	***$42.84***		

Table 5 shows the median water bill for 8,000 gallons/month based on the water treatment type of chlorination versus other treatment types. A system is defined as using "other" treatment types, even if chlorination is used as well. The median monthly water bill for 8,000 gallons is $13.74 less for systems that utilize just chlorination than for systems that use chlorination and other treatment methods. Whether purification methods in addition to chlorination are needed depends on the various factors including water source type, water source quality, and the age of the system's infrastructure. All four county utilities use other treatment methods in addition to chlorination. These methods include granular activated carbon (GAC), corrosion control, microfiltration (MF) membranes, and reverse osmosis (RO).

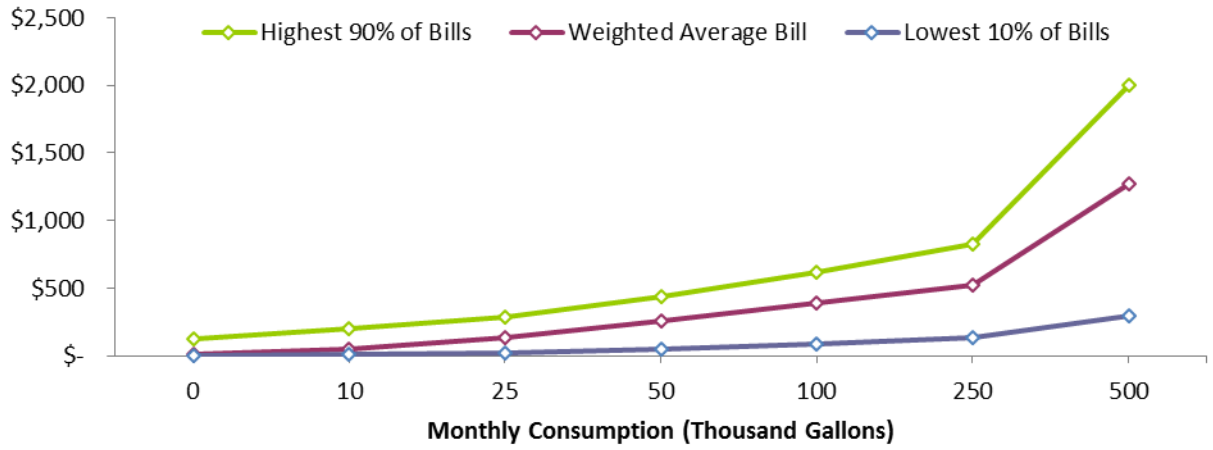
Table 5: Median Charge for 8,000 gallons/month for Water Systems Based on Treatment Type

Treatment Type	Total Number of Rate Structures	Median Monthly Bill at 8,000 Gallons
Chlorination	29	$38.10
Other	10	$51.84

Commercial Water Bills

Figure 11 shows the ranges of how much systems in Hawai'i are charging their non-residential, or commercial, customers based on different consumption levels, including the base and variable charges[6]. The area between the top green line and bottom blue line represents what the middle 80 percent of systems charge. The magenta colored line in the middle indicates the weighted average across all systems. As with residential rates, the weighted average monthly water bill for zero gallons of water (base charge) on a ¾" meter[7] is $11.57. The weighted average monthly bill for 50,000 gallons/month is $263.41, while the weighted average bill for 500,000 gallons/month (on a 1½" or 2" meter) is $1,272.39. The variation in commercial bills across rate structures increases significantly as the consumption amount increases.

Figure 11: Monthly-Equivalent Commercial Water Bills by Consumption (n=39)



[6] The residential rate structure is used to calculate the bill amounts for commercial customers, except for systems that specify different rates and rate structures for commercial or non-residential customers.

[7] Some systems use different base charges for different meter sizes for customers. Bills for consumption of up to 100,000 gallons/month were computed assuming a 5/8" or 3/4" meter size, 250,000 gallons/month assuming a 1" meter size, and 500,000 gallons/month assuming a 1½" or 2" meter size. When applicable, the "next largest" meter size is used in calculating the bills when a system does not set a base charge for that particular meter size.

Affordability of Residential Rates

What the Average Hawai'i Resident Pays for 8,000 Gallons

The figures and tables above illustrate the range of rates and bills that systems are charging across the state. The systems in this study serve about 1.33 million Hawai'i residents. If we assume that everyone in this sample pays residential rates only, the average Hawai'i resident in this sample would be paying a weighted average of $44.27/month for water for 8,000 gallons, which is near the average level of consumption in the state. These numbers represent an approximation of average bills across the population of the state. Some residents may be paying a portion of their water bill through irrigation rates, making it difficult to accurately determine what the average Hawai'i resident actually pays for 8,000 gallons.

Annual Bills as a Percent of Household Income

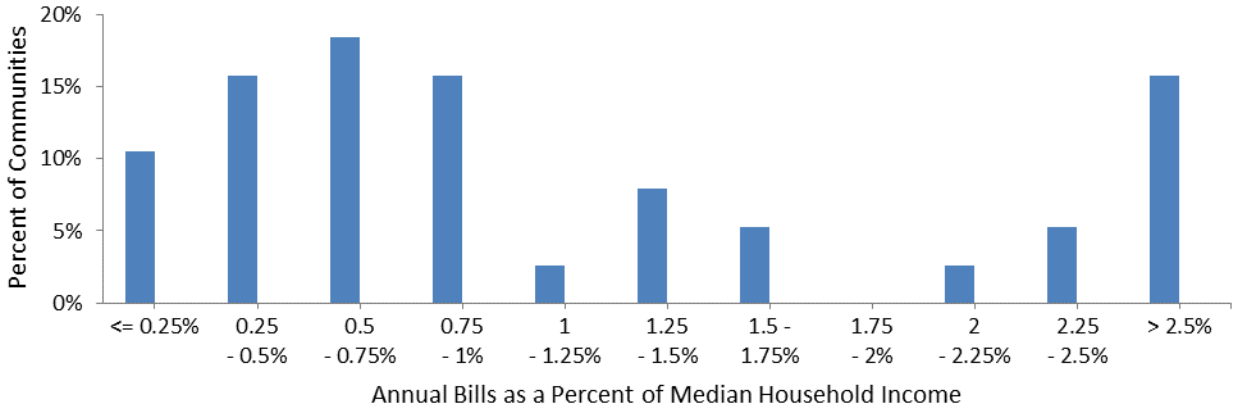
Is the weighted average bill of $44.27 per month for 8,000 gallons of water too high for most Hawai'i residents? Compared to monthly electric bills, gas bills, grocery bills, and even discretionary bills such as cable TV bills or high-speed internet bills, water bills usually make up a smaller portion of a household budget. Nevertheless, because residents may not have an alternative to the water service they are currently receiving, and water service is necessary for public health, the issue of affordability of water rates remains vital.

Affordability is very difficult to assess, and there is no one true, accurate measure for affordability. The most commonly used and most cited measure in the water industry is "percent MHI"—that is, calculating what a year's worth of water bills for an average level of consumption (e.g. 8,000 gallons/month) is compared to the median household income (MHI) in the community served by the system. This indicator is easy to calculate by using the calculated bill amount and the U.S. Census Bureau's median household income data from the latest 5-year American Community Survey estimates, available at http://factfinder2.census.gov. Each year, the US Census Bureau publishes a new estimate of MHI for each Census Place in the country.

Compared to the 2015 median household incomes of the 28 census places served by the 38 water system rate structures in this survey for which there is census data, annual water bills for 8,000 gallons/month range from less than 0.25 percent MHI to nearly six percent MHI. The majority of water rates fall between 0.25 percent and one percent MHI, as shown in Figure 12. There are nine rate structures that charge water bills at 8,000 gallons/month that exceed two percent MHI for their served communities, all with a service population of less than 5,000 people.

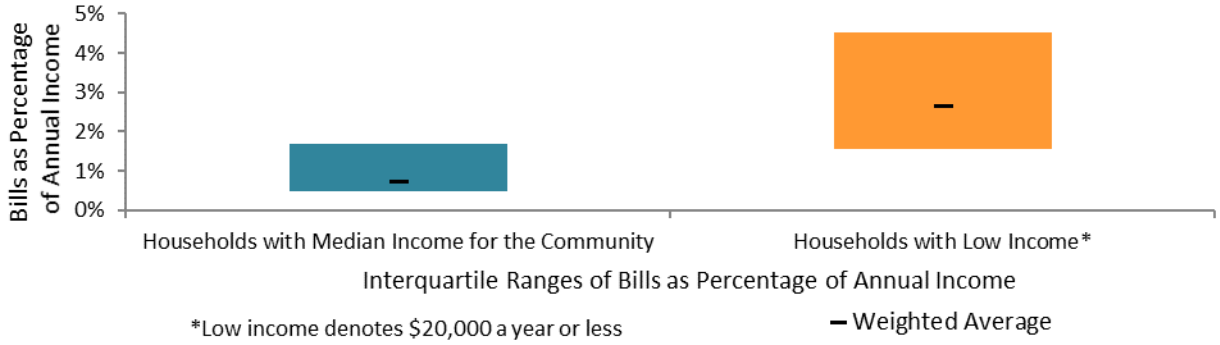
The weighted average percent MHI figure across the State of Hawai'i is 0.76 percent MHI. This means that the "typical" Hawai'i resident, using an average level of consumption of around 8,000 gallons/month, is paying water bills that, on average, are nearly 0.76 percent of the annual household income level of the median income household in their community. There is no single target for affordability, even in terms of percent MHI. However, on the Hawai'i Water Rates Dashboard, water bills that make up less than 1 percent of the MHI for a community are displayed as "green" on the Affordability dial.

Figure 12: Annual Water Bills for 8,000 gallons/month Consumption as a Percentage of the Serviced Community's 2015 Median Household Income (n=38)



The left-hand bar in Figure 13 shows the interquartile range of the percent MHI figures of water bills at 8,000 gallons/month. This metric has some shortcomings, but it does show the variation in financial impact across the state. In a quarter of the systems, customers making the median household income in their communities would spend less than 0.50% of their income annually for 8,000 gallons/month of water, whereas in another quarter of the systems, those median household income customers would spend more than 1.70% of their income. The right-hand bar in Figure 13 shows what percentage of income a household that makes $20,000 per year (near poverty threshold) would pay for the same volume of water. Not surprisingly, the bills amount to greater percentages of this low household income level. This method of showing how two affordability metrics compare across the state shows that while there are some systems that have customers at the median income paying relatively little, these communities still have prices that place a greater burden on lower income customers. Larger low-income families, or families that live in substandard housing stock with less efficient appliances, may end up paying an even higher percentage of their income for essential water service.

Figure 13: Percent of Annual Income spent on Water for Median Income Households and Low Income Households, among 38 Water Systems



Do Prices Reflect the True Cost of Water Services in Hawai'i?

Comparing rates across the state or among specific systems is further complicated by the variation in the extent to which systems account for the full cost of providing service. For example, during FY2015-16, seven of the 17 (41 percent) water systems in Hawai'i for which financial data is available did not generate enough operating revenues during the year to pay for their operating expenses. Operating expenses include day-to-day operations and maintenance expenses and depreciation expense, which acts as a surrogate (albeit an imperfect measure) for some future capital costs for replacing deteriorating assets[8]. When operating revenues fall short of operating expenses, systems typically either draw down reserves to pay for expenses, or postpone or cancel some capital projects to reduce expenses. Sustained gaps between operating expenses and operating revenues year after year will eventually lead to deteriorating infrastructure and endanger the public health of the customers of the water system.

Smaller systems were more likely to have operating expenses exceed their operating revenues, as shown in Table 6, further exacerbating the financial difficulty faced by many systems. Access to capital may be more difficult among the smallest systems—those serving 1,000 people or fewer—than for larger systems, such as those serving 20,000 people or greater. Thus, capital improvement strategies for small systems may be less likely to be funded by long term debt and more likely to be funded by cash. Still, half of the smallest systems were not able to generate sufficient operating revenues to cover their day-to-day expenses and depreciation expense. In contrast, only one of three large water systems had operating expenses exceeding operating revenues in FY2016. Put another way, two out of three large water systems were able to cover operating expenses including depreciation, while only half of small systems met this benchmark.

Table 6: Systems with Operating Expenses (including Depreciation) Exceeding Operating Revenues in FY2016, by Service Population

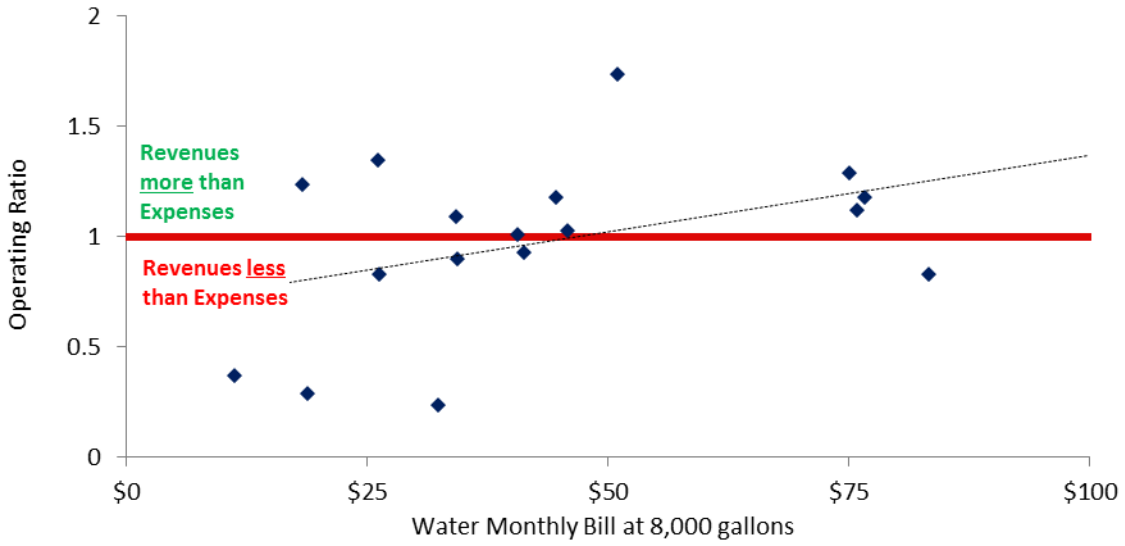
Service Population	Number of Systems with Financial Data	Number of Systems with Operating Revenues less than Operating Expenses	% of Total
1 - 1,000	6	3	50%
1,001 - 5,000	5	2	40%
5,001 - 20,000	3	1	33%
>20,000	3	1	33%
All Sizes	17	7	41%

It is worth noting that rates that provide enough revenue to balance an annual budget do not necessarily provide enough revenue to cover long term capital and maintenance needs, and many systems charge much less than

[8] Depreciation is an accounting mechanism designed to model the reduction in the value of capital assets across time due to normal wear and tear. Hence in capital improvement planning, there is a corresponding need to budget for capital projects that reflect the full cost of replacement of an asset, and factoring in the non-cash "depreciation expense" from the use of depreciation schedules can be helpful in some situations. At the same time, systems that already have a strong Capital Improvement Plan in place and are funding their capital improvements through long-term debt, grants, cash savings, or some combination thereof, would not necessarily need to cover "depreciation expense" at the same time, as that would be duplicative.

the full cost of service provision. Figure 14 shows the most current water bills charged for customers using 8,000 gallons/month plotted against the ratio of operating revenues over operating expenses (including depreciation) in FY2016. This measure, often referred to as an operating ratio, helps identify if an entity is operating at a financial loss, financial gain, or is breaking even[9]. The figure displays the 7 systems that are not covering their total operating expenses below the solid red line. These systems will find it difficult or impossible to rehabilitate aging infrastructure, save for operating emergencies, finance system improvements and expansion, and engage in proactive asset management if the operating ratios remain low every year.

Figure 14: Residential Bill in FY2016-17 for 8,000 gallons/month for Systems with Reported Fiscal Data on Total Operating Revenues and Total Operating Expenses in FY2015-16 (n=17)



Generally, systems with lower water rates are more likely to have low operating ratios. Six of the ten systems charging the lowest water bills for 8,000 gallons of consumption generated operating revenues that were less than their operating expenses. There are many other factors that influence the operating ratio in any given year, but charging rates that do not cover the full cost of service is a significant contributing factor.

It is interesting to note that the systems that did not recover their operating expenses (operating at a financial loss) are not always charging low rates. The system charging the highest among the 17 systems with financial data also failed to generate sufficient operating revenues in FY2016. This illustrates that other factors can influence the operating ratio for systems.

[9] Operating ratio as calculated here may be a flawed measure, however, due to the distorting effects of book value depreciation. Due to inflation, older plants' assets that were purchased long ago have nominally cheaper prices than assets of plants that are newer. This makes older plants' depreciation expense smaller in comparison to the depreciation of a newer plant with the same types of assets. In turn, this means that the operating ratio seems higher (better) for older plants than for newer plants, due to the effect of inflation. Despite this, the measure maintains a level of intuitive power which makes it a useful tool for examining the ongoing capacity for the system to bring in enough revenue to cover its operating costs.

The operating ratio of systems in the rates survey can be viewed alongside comparisons of rates and water bills in the Hawai'i Water Rates Dashboard.

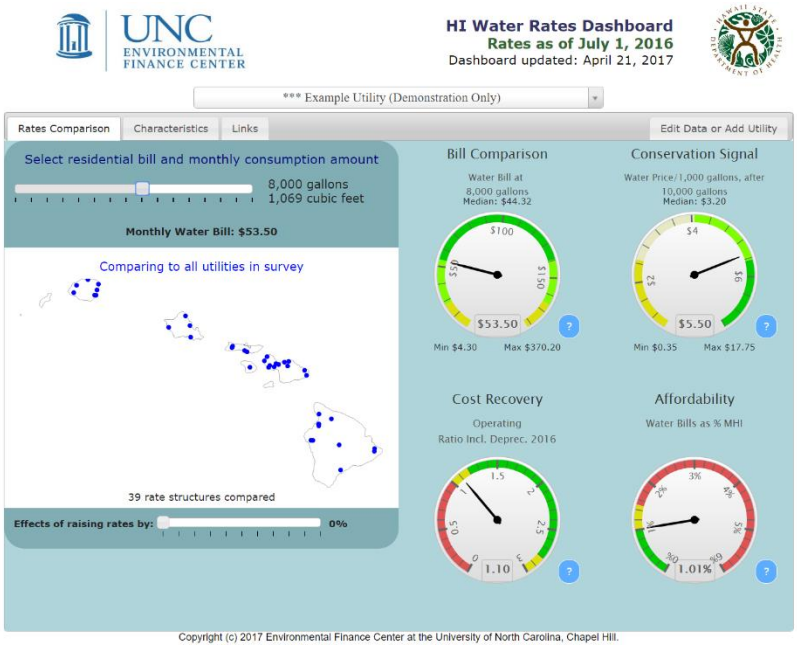
Concluding Remarks

There is significant variation in the rate structure design and rates charged customers among the 39 rate structures included in this rates survey. The four county water utilities, which serve more than 85 percent of the community water system-served population of Hawai'i, rely more on their variable charges and use increasing block rate structures to encourage conservation, while the smallest systems rely much more heavily on their base charges and simple rate structure designs for revenue stability. Comparing the rates charged by systems against one another can be misleading if the differences between the systems are not highlighted, and will always yield inaccurate or incomplete information for decision-making unless more data are considered simultaneously, such as the financial performance of the system, its rate setting objectives, the size of the customer base, the socioeconomic conditions of the community, and other characteristics. As part of this rates survey effort, supplemental resources have been developed by SDWB and the EFC to aide decision-makers in comparing rates appropriately in the state of Hawai'i.

Supplemental Resources

In addition to this report, SDWB and the EFC have made available:

- tables detailing each system's rates and key components of their rate structures,
- copies of the rate structures of participating systems, and
- an interactive Hawai'i Water Rates Dashboard that combines a system's financial, physical, and customer characteristics with the capability of comparing rates among systems that are similar in various categories.



All of these resources can be downloaded or used at http://www.efc.sog.unc.edu/Hawaii-water-rates-survey, free of charge.

For advice on rate setting or more information on making appropriate rate comparisons, please contact Glenn Barnes (glennbarnes@sog.unc.edu) at the Environmental Finance Center.