**Benchmarking Utilities’ Rates and Finances for Decision and Policy Makers**

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**ABSTRACT**
The Rates Dashboard is a benchmarking tool developed to assist water and wastewater utility managers and decision-makers in developing rates that adequately fund necessary programs such as asset replacement and management. The Rates Dashboard is a free, interactive tool designed to allow users to compare rates across a given region while simultaneously considering financial, affordability and socioeconomic indicators. The tool graphically displays all of this information in the form of simple dials and maps instead of complex tables and spreadsheets. It provides managers, planners, board and council members, reporters, and citizens alike with an easy way to quickly and clearly benchmark a utility’s rates and financial performance, without having to navigate through the underlying data. The Environmental Finance Center at the University of North Carolina in the United States has developed unique Rates Dashboards for four states and is developing one for Canadian utilities. In this paper, the authors use the North Carolina Rates Dashboard as an example to describe the creation of the dashboard, its elements and its applications. The Rates Dashboards are proving to be useful in communicating the information that decision-makers need in order to adopt reasonable rates for water and wastewater services.

**Keywords:** benchmarking, rates, finance, data visualization
INTRODUCTION

When presenting the case for asset management to a water or wastewater utility, the response is hardly ever “No, that sounds like a terrible idea!” Instead, utility managers/owners are usually very open to the idea, but express that they do not have the financing that would allow for asset management. Lack of funding, whether for personnel to develop the asset management plan itself, or for replacing a critical asset, is usually the reason that many utilities do not embark on the asset management process.

In the United States, as in many other countries, utilities derive the large majority of their funds from the rates and fees they charge to their customers (GAO, 2002). The lack of funding for asset management then begs the question “Are utilities charging enough for the services that they provide?”

BACKGROUND

Utility managers are constantly confronting the issue of setting appropriate water and wastewater rates to meet competing objectives. Rates should be set to ensure financial sustainability of the utility, maintain affordability for its customers, while supporting policy goals of the region, such as promoting water conservation. Setting rates to accomplish these goals and evaluating them afterwards requires the use of data from multiple sources simultaneously.

Any effort to modify rates should be founded on a careful study of a utility’s revenue needs, policies and customer base. However, utilities sometimes engage in a comparative analysis of other utilities’ rates, and there is statistical evidence that this practice has an influence on the rates being set (Thorsten, Eskaf and Hughes, 2009). Comparative information can be useful to benchmark rates, but it also can be harmful if taken out of context and used inappropriately. For example, there may be “peer pressure” to keep rates lower than necessary simply because a quickly prepared table of neighbouring utility rates shows other utilities with lower rates. An anecdote provided by one southeastern United States utility involves the utility comparing the rates of the five nearest water utilities and then setting its own rate to be the second highest rate every year. The simple rationale given was that the utility in question “wants to avoid making the newspaper headlines.” These types of comparative analyses are common among utilities, usually providing poor benchmarks and leading to poor decisions.

On the other hand, comparing large amounts of data can be overwhelming. In the work that the Environmental Finance Center (EFC) at The University of North Carolina at Chapel Hill does with communities, it has been found that it is easy for local leaders to get overwhelmed by numbers and data if these data are not presented properly. Clearly, there is a need to collect and analyze much data to assist the decision-making process, but a new strategy is necessary in compiling and sharing these data with policy and decision makers who are almost never engineers or data analysts. The EFC approached these challenges by using data visualization techniques to target the decision makers directly. For-profit commercial industries have long used data visualization techniques, often called “business intelligence,” to analyze data on their customers. These techniques can be applied to the water and wastewater industry to provide a
new and better approach to benchmarking data for decision makers. The EFC applied data visualization techniques to create free, interactive Flash-based tools titled Rates Dashboards.

METHODS

To create the Rates Dashboards, the EFC collected and linked primary and secondary data for hundreds of utilities in four states in the southeastern United States, and is currently developing a Rates Dashboard for Canadian utilities with AECOM. Each dashboard is slightly unique. In this paper, the authors use the example of North Carolina’s Rates Dashboard to describe the methods used in creating the dashboard, its elements and its applications. Funding for creating the NC Rates Dashboard was provided by the Public Water Supply Section of the North Carolina Department of Environment and Natural Resources as well as the United States Environmental Protection Agency.

Primary Data Collection and Analysis: Survey of Utilities’ Rate Schedules and Bill Calculations

The EFC works with the North Carolina League of Municipalities (NCLM) to collect rate schedules from utilities across the State of North Carolina. All local government-owned and not-for-profit utilities in the state are contacted annually by email, fax, letter or phone, inviting them to participate in the annual process. Response rates are usually extremely high, possibly owing to two main factors. Firstly, a respondent utility receives the direct benefit of being able to compare itself to other utilities in the Rates Dashboard itself, which is now well-known and well-used in the state. There is little free-rider effect because a utility that does not respond cannot select itself on the interactive dashboard to see where it falls. Secondly, and perhaps more significant to the explanation of the high response rate, is that the utility effort is minimal. Each utility is only asked to send a copy of the rate structure that is already published and easily accessible (for example, some utilities include the rate structure on the back of each customer bill, or on their website). No questionnaire is filled out, no calculations need to be made, and it takes each utility only the time it takes to locate a copy of their rate sheet and fax it or email it to the EFC or NCLM. In 2011, 494 utilities in North Carolina, representing 91 percent of the utilities that were contacted, responded by sending in their rate schedules. These utilities serve approximately 7.7 million North Carolinians and account for 99 percent of the population served by all local-government owned and not-for-profit water and wastewater utilities in the State. In the past four years, the response rate has been consistently high.

Once collected, the rate schedules are then input into a model created by the EFC. This model calculates what residential and commercial customers of each utility is billed for their water, irrigation and wastewater service, at any consumption level, in any part of the service area of the utility. The EFC uses this model to compute the monthly-equivalent bills charged to customers for a range of consumption levels and enters the data for each utility into the Rates Dashboard model.

Secondary Data Collection

As highlighted earlier in this paper, part of the problem that decision makers face is the overwhelming amount of data that is relevant to water utility management and rate setting. In addition to the sheer volume of data, another complicating factor is the disparate sources of the
data. The following list summarizes sources for the data involved in creating various aspects of the North Carolina Rates Dashboard.

**Financial Performance Data**
The EFC collects financial performance data on more than 540 local government water and wastewater utilities in the State of North Carolina from the Local Government Commission (LGC). The LGC, a commission within the State’s Office of the Treasurer, annually collects and compiles financial data on all local government units in North Carolina in order to monitor and analyze their fiscal and accounting practices. These data are used by the EFC to calculate utility-level financial benchmarks such as the cost recovery dial that is seen in Figure 1.1, and all of the dials in Figures 1.5 and 1.6.

**Demographic Data**
Data on parameters such as the Median Household Income (MHI) for each service area come from the United States Census Bureau. The 2000 decennial survey data on income levels in all communities in the United States were used, adjusted to present day values using yearly inflation factors provided by the United States Department of Housing and Urban Development (HUD). This method mirrors the process used by funding agencies in comparing the rates charged by utilities to the (current) income levels of the communities when evaluating loan and grant eligibility. The median household income data are used to calculate benchmarks for the “affordability” dial in Figure 1.1.

**System Characteristics**
Information regarding the number of connections and service population served by a given utility is derived from the Safe Drinking Water Information System (SDWIS) which is maintained by the federal U.S. Environmental Protection Agency. SDWIS also provides data on the source of water (groundwater, surface water, or purchased water) and the principal county served by each utility.

**Geographic data**
The backbone of spatial data used in the Rates Dashboard to identify the geographic location of every utility comes from GIS shapefiles compiled by the North Carolina Center for Geographic Information and Analysis and the North Carolina Rural Economic Development Center. The EFC supplemented these data with point locations of utilities and systems’ that were missing coordinates from the existing shapefiles. The EFC used Google Earth to identify latitude and longitude coordinates of the utilities using known street addresses.

This list of data sources serves to underscore how burdensome it is for an individual water/wastewater utility to assemble all of the relevant data in order to perform intelligent comparisons and create reasonable benchmarks for rate setting. The EFC linked the secondary data with the primary rates data described above into a single spreadsheet from which the Rates Dashboard was created.

**Creation of the Rates Dashboard and Dissemination of Results**
All data are combined and arranged into the Rates Dashboard using visualization software that converts an Excel spreadsheet, with its functionality, into a Flash-driven file that allows a user to
select a few inputs and observe results in the form of dials, graphs, maps, gauges, and other visualization elements. The Rates Dashboard is then posted on the EFC’s website at http://www.efc.unc.edu/RatesDashboards/ and access is provided for free to all users. Utilities are contacted directly informing them of the availability of the updated dashboard. A video tutorial is also provided for new users of the dashboard.

In addition to the Rates Dashboard, the information on rates and rate structures across the state are compiled into annual reports and tables and shared with relevant utility professional staff and decision makers. Dissemination is in the form of presentations and dashboard demonstrations at relevant professional association conferences, local government elected official conferences, and individual utility governing body meetings.

RESULTS

While each state’s Rates Dashboard is unique, they follow the same general design and application patterns. The elements of North Carolina’s 2011 Rates Dashboard is described here as an example.

Rates Comparison Tab
Figure 1.1 is an image of the dashboard’s Rates Comparison tab. Each one of the 494 participating utilities can be selected from the top drop-down menu (input 1). The Rates Dashboard benchmarks that utility’s financial performance while allowing for comparisons of its water, sewer or combined rates (input 2) at one of five consumption points signifying low, average and high consumption levels (input 3), affordability and conservation pricing signals to dozens of other utilities with similar characteristics based on utility size, water source, river basin, community socioeconomic conditions, or geographic region (input 4).

When the comparison group is changed, the map refreshes revealing only the utilities that are similar in characteristic to the main utility (e.g. only systems using groundwater, or utilities within the same river basin, etc.). Likewise, the Bill Comparison and Conservation Signal dials are updated by filtering the benchmarks based on the selected comparison group only.
The following are explanations of each of the four dials. These explanations are also available from the interactive tool itself by the user clicking on the question mark icons next to each dial.

**Bill comparison**

This dial shows what a residential customer is charged monthly for the selected consumption level for water/sewer or water and sewer combined (depending on what is selected), relative to what is charged by other utilities in the same comparison group. The colour code is explained in Figure 1.2. The darkest green shows the middle 50 percent of other utilities’ bills, the lighter green indicates the middle 80 percent, while the yellow shows the 10th percentile and the 90th percentile in the comparison group. A utility that charges bills in either yellow area is either charging more than or less than 90 percent of all similar utilities in the
comparison group.

**Conservation Signal**

This dial shows the charge for the next 1,000 gallons (3,785 liters) per month when a customer goes beyond 10,000 gallons. It is one of several pricing signals that the utility sends to its customers to encourage conservation. This parameter mostly affects residential customers with high summer consumption. Figure 1.3 gives an explanation of the colour coding for this dial, which separates out the price signals charged by all of the similar utilities in the comparison group into quartiles.

**Cost Recovery**

This dial shows the operating ratio, which is a measure of whether the utility’s rates are sufficient to cover the cost of operations and capital (in the form of depreciation). It measures operating revenues divided by operating expenses including depreciation in the latest Fiscal Year. A ratio of less than 1.0 could be a sign of financial concern. In general, this ratio should be higher than 1.0 to accommodate future capital investments, which will be more expensive than depreciation on assets that were purchased several years ago.

**Affordability**

While there is no universally accepted definition of “affordable rates” for water and wastewater, this dial attempts to gauge affordability by showing the percentage of Median Household Income (adjusted for 2010 by using the HUD inflation factors) spent annually on water, sewer, or combined water and sewer bills for the selected monthly consumption level amount in the given community. Other factors such as poverty rate will also influence the affordability of rates. This indicator is commonly used by funding agencies to determine eligibility for grants or loans.

A substantial amount of information is presented in each of the four gauges described above, and each serves its own purpose. However, taken together, all four gauges paint a much more comprehensive picture of how the utility compares in its rates, within the context of cost recovery and affordability. This is a very important aspect of the Dashboard. Without getting the full picture, rates comparisons (alone) can lead to faulty and risky decisions.

**Slider to Model Rate Increases**

The dashboard also models potential effects of raising rates by up to 50 percent by using the slider on the bottom left (input 5). Figure 1.4 shows a simulation of a 13 percent rate increase for the given utility. All four dials have changed to show the modeled effects on the utility's rates, revenues and rate affordability. Price elasticity is included in the simulation.
Financial Benchmarks Tab
In addition to the rates comparisons, the Rates Dashboard also provides information on utility financial health and customer demographic profiles for each utility. Figures 1.5 and 1.6 show the eight financial benchmarks in the last fiscal year or the trends of the last three fiscal years, respectively, for all local government utilities using the data obtained from the LGC.
Figure 1.5: Financial Benchmarks for the Latest Fiscal Year

Figure 1.6: Trends of Financial Benchmarks over the Last Three Fiscal Years
A user can click on the “More info” buttons for a detailed explanation on each of these financial benchmarks written in simple language, the equation and data used for the calculation, and statistics on how utilities in North Carolina are faring in this benchmark. For example, Figure 1.7 illustrates the information that pops-up if a user were to select the “More info” button related to “Debt Service Coverage Ratio.”

![Operating Revenues - Operating Expenses excl. Depreciation](image)

Debt Service Coverage Ratio measures the ability to pay for debt service and day-to-day expenditures using operating revenues (mostly charges to customers). A ratio of less than 1.0 indicates that revenues were insufficient to cover the utility’s day-to-day expenditures and payments on principal and interest on existing long term debt, and the utility runs the risk of going into default. A negative ratio indicates that operating revenues were less than day-to-day expenditures alone, forcing the utility to look to nonoperating revenues to cover the difference and their debt payments. In general, this ratio should be higher than 1.0 in order to also set money aside for future capital investments. Water systems applying for state funds to expand or extend service are required to achieve a ratio greater than 1.0 (with a few exceptions).

Among 375 utilities with long term debt in FY 2010, 70% had a ratio >=1, and 57% had a ratio >=1.25

**Figure 1.7:** Explanation of the Debt Service Coverage Ratio Benchmark

CONCLUSION

Besides the example from North Carolina outlined in this paper, Rates Dashboards have been developed for three other states, and the EFC has received requests to create similar ones across the United States and Canada. At the utility level, many utility managers have reported that they have used the Rates Dashboard to successfully make the case for raising rates in jurisdictions where rate increases were previously blocked by unconvinced governing bodies worried about affordability for customers or that the utility’s rates may seem too high compared to other utilities’ rates. Using the Dashboard, utility managers were able to present information on affordability and rates comparisons, along with critical information about cost recovery. Utilities that have historically maintained lower-than-necessary rates due to affordability or comparison concerns can now clearly see that they are not recovering enough revenue to pay for their expenses, and the case for a rate increase becomes more apparent to the decision maker. The important decision to increase rates leads to the generation of revenue that is needed for proper utility management. The inclusion of all four dials on the same screen provides decision-makers with much information simultaneously at a glance that would normally require shifting through several tables and spreadsheets. The use of vehicle dashboard-looking dials with traditional red-yellow-green colours also simplifies the process of understanding the information in the context of achievable and responsible targets.
In North Carolina, a recent survey asked utility managers: “At the end of your last rates review, what did your utility present or share with your Governing Board (City Council / County Commissioners / Board of Directors) in charge of reviewing and adopting rate adjustments?” Fifteen percent (15%) of utilities responded that one of the things they shared was the Rates Dashboard (Eskaf et al, 2011). In addition to this statistic, several individual utilities have provided anecdotal statements to the EFC saying that the Rates Dashboard helped to convince the governing bodies to adopt rate increases. The following are a few examples from North Carolina:

“This is a great visual tool... one that I saw ... at a Water Crisis meeting up here a few weeks ago. I immediately had a link to it placed on our new website so that anyone (especially Board members) could access and compare.” – Utility Manager in North Carolina.

“Thank you ... so much for creating this tool. With the information provided our board realized exactly where we stood and why we were prohibited from making infrastructure strides. This tool has helped us adopt a rate structure that is fair and provides for system upgrades such as radio read meters, strategic pump station repair etc. ... This is a genuine asset for small towns such as ours. We appreciate and often use this tool.” – Town Manager in North Carolina.

“By the way, the Dashboard was an integral part of our presentation today. Thanks for maintaining this tremendous resource for NC utilities.” – City Manager in North Carolina.

“Your Rates Dashboard is great! Thanks for spending so much time collecting data and building the computer program. It is quite remarkable.” – Utility Manager in North Carolina.

“I was very interested in how [our utility’s] information would appear on your Water Rates Dashboard site and I was pleasantly surprised. I shared this information with [our governing body] Monday evening and they were very impressed with your ability to harness all of the data into a simple, easily read format.” – Utility Director in North Carolina.

“First, let me commend you and your staff on the rates dashboard. I think that is a great tool and allows us to provide great information to our elected boards.” – City Manager in North Carolina.

“I just wanted to let you know that the rates dashboards you have developed are great tools for local governments. I appreciate your efforts in merging data and technology to provide us with something very useful. We are now using it as we finalize the budget presentation.” – Utility Manager in North Carolina.

Recently, the City of Reidsville in North Carolina won a State Treasurer’s Award for Excellence in Accounting and Financial Management based on the City’s comprehensive in-house utility rates study that was created in conjunction with information from the Rates Dashboard. “The results of the study allowed the City to adopt a rate structure that is expected to provide sufficient cash flow for the Utility Fund and to make it compliant with full cost recovery” (Edmundson, 2011).
Visualization tools such as the Rates Dashboards are useful in displaying information in an easy-to-understand, interactive, visually appealing format, and can simultaneously increase the amount of data a decision-maker can use to make much more well-informed decisions. Application of business intelligence can lead to significant improvements in the creation and management of Asset Management Plans and other processes to assist in the financial planning for the utility.

REFERENCES


