

Data Availability as a Key Tool for Regulating Government-Owned Water Utilities

By Sanford V. Berg and Michelle A. Phillips¹

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Abstract

This article examines factors that are important for data collection and information initiatives in the water sector, where government ownership and operation is often the case. The problems are compounded for fragile, conflict-affected, and low income states. This study presents issues, potential actions, and supporting examples for monitoring and evaluating infrastructure utility performance. “Good practice” examples from developing countries are presented to illustrate the impacts of data availability on sector performance.

This article focuses on initiating and improving data-collection processes, in order to monitor performance and set targets when significant data limitations exist, as is generally the case in developing nations (including low income, fragile, conflict-affected countries). Municipal and other government-owned utilities dominate the water sector for a number of reasons: early entry of municipal utilities linked to urban transport and the provision of other “essential” services, citizen desire for low prices (and, ironically, high coverage and service quality), opportunities for political benefits, and lack of private investor confidence in the financial sustainability of urban and rural utilities in developing countries. While situations will vary, those setting and implementing infrastructure policy can expect data availability and quality to be a problem. In fact, public policy that does not require data collection, authentication, and transparency can be the source of data limitations.

Of course, one should distinguish between data transparency and data availability (and quality), since the former is related to information asymmetry where agencies providing oversight lack access to data necessary to evaluate efforts to improve performance. The latter depends on the adequacy of procedures (and incentives) affecting data collection, correction, authentication, and analysis. Here, we focus on the latter, while recognizing that transparency affects how citizens and those implementing policy can press for better outcomes in the water sector.

Decision-makers manage what they measure. In the absence of effective information systems (and independent audits of financial and operating data), management lacks a key tool for improving performance. Furthermore, without adequate resources (and incentives) for developing and maintaining comprehensive decision-support systems, financial sustainability remains unlikely, especially in low-income states that have problems with data reliability and accuracy. Note, however, that the purpose of this study is not to provide a theoretical model of how information investments and flows affect

¹ Professor Emeritus, Economics and Lecturer, respectively, University of Florida. Corresponding author’s email: sberg@ufl.edu. The authors are grateful to comments from World Bank professionals Sara Ahmed, Anna Aghababyan, Jemima T. Sy and Shyamala Shukla—though they are not responsible for our conclusions. Comments from reviewers were especially helpful. This study extends work developed with funding to the Public Utility Research Center from the Private-Public Partnership Infrastructure Advisory Facility: portions appear in <http://regulationbodyofknowledge.org/launching-or-revitalizing-regulatory-systems/>. The conclusions do not necessarily represent those of sponsoring organizations.

performance in an infrastructure industry. Nor do we present a comprehensive database documenting where different countries are on the “data availability” spectrum. Such a project goes far beyond our current objectives. This study attempts make policy scholars and those developing and implementing policy more aware of data availability as a facilitator of better operating performance and as a key characteristic of sound governance.² A number of examples from developing countries illustrate how some initiatives have made a difference in citizen access to affordable water.

1. Why Good Data are Important, and Why the Data-Collection Process Matters

Data requirements and associated managerial (and regulatory) processes for creating incentives involve setting targets. Data are necessary to address several important questions in infrastructure industries— from operating efficiency to financial sustainability. Some key considerations include how inputs are related to outputs; how input prices translate into costs; and what external factors affect output and costs. Because private-sector engagement in low income states will depend on investors being able to analyze the operator’s track record regarding cost, service quality and revenues, forecasts of financial and operating performance will affect the willingness of private sector to invest. Moszoro *et al.* (2014) wrote: “Controlling for economic characteristics, we find that overall private participation of infrastructure financing increases with freedom from corruption, rule of law, quality of regulations, and decreases with court disputes.” Thus, the transparency associated with information availability and data quality is central to improving performance and represents the starting point for realistic business plans.

There are several reasons why data availability and information transparency may not be desirable for managers of government owned utilities (GOUs). For example, (1) information systems require resources, and developing countries are constrained by their limited budgets; (2) managers may not wish to make the politicians look bad; (3) managers may want to avoid comparisons with other utility companies; (4) managers may not want to reveal the extent of subsidies received or a utility’s financial disarray; (5) managers or politicians may be using the utility to satisfy other goals such as employing members of the political party in power.

Such managerial and political reservations do not justify the lack of performance information that would enable citizens to evaluate the funding and operation of utilities. Of course, data collection is costly, but it is also essential if managers and those setting and implementing public policy are to be in a position to make good operating and financial decisions: executives manage what they measure. The most important elements of the data-collection process are: (1) the creation of a dedicated team to identify the relevant variables and sources of information; (2) involving stakeholders in defining the data; (3) establishing procedures and schedules for collecting and authenticating the information (including secure and cost-effective data-handling techniques); (4) ensuring data accuracy and data consistency so comparisons can be made across utilities and over time; (5) developing policies on disclosure; and (6) analyzing the data and using it to strengthen engagements with different stakeholders. A water-point mapping initiative in Liberia provides an example of this sequence of steps, with the additional focus on leveraging ICT to facilitate data entry³. Given the conditions present in developing countries (including

² The details of establishing regulatory processes, analyzing costs, benchmarking, tariff-setting, establishing performance targets, designing incentives, publicizing outcomes, and other features of the regulatory system are beyond the scope of this study. The interested reader is referred to www.regulationbodyofknowledge.org for a comprehensive overview of these important topics.

³ <http://wash-liberia.org/data-maps/>

fragile and conflict affected states), data collection initiatives are usually possible through the collaboration of several entities. In the case of Liberia, the creation of a digital map inventorying safe water points was possible thanks to a collaboration between the government and NGOs such as the World Bank and UNICEF. Thus, development partners can provide seed money, but ultimately, support from local leaders is essential if such initiatives are to promote greater transparency. Such initiatives must be sustained by being incorporated into utility and regulatory procedures for their full positive impacts to be realized.

In situations where the state is not providing infrastructure services, the data collection process can be transferred from donor initiatives to national agencies as a state matures. Uganda provides an example of a country that developed a national monitoring system for water and sanitation systems. According to Ssozi (2013), Uganda introduced data collection and monitoring in order to increase efficiency in the use of resources and to help in strategic decision making and planning. In the 1980s, Uganda's water system consisted of multiple donor projects, as is currently the case in many fragile states. In 2001, sector reforms led to decentralized service delivery, and by 2004 the country had established a sector performance management framework with eleven Key Performance Indicators (KPIs). The government, together with development partners, supported a single sub-sector policy development plan. Today, Uganda has "golden indicators" to measure water performance; these include data on water access, quality, and quantity. The National Statistics Bureau and the Ministry of Water worked together to ensure that the same definitions were used across the board. The collection effort is the result of a cooperation between government institutions and NGOs. Annual sector performance reports provide information on key achievements and emerging challenges. Several lessons emerge from Uganda's experience. Once infrastructure delivery is transferred from NGOs to the states or municipalities, it is important to integrate monitoring with existing national processes, keep it simple, and to define institutional responsibilities and data sources (Ssozi, 2013).

The data-collection process needs to recognize that information systems are not free; at the same time, data on trends and patterns across geographic areas are central to sound regulation, effective management, and access to both public and private capital. When infrastructure is funded by government (taxpayers), evidence regarding the cost effectiveness of these scarce funds is one determinant of more predictable government transfers (and loans) in the future. Political leaders will want to have evidence that management will use funds wisely and that citizens (and politicians) consider the financial sustainability of the operator to be important. Demonstrating unbiasedness and expertise is one way regulators can signal their intentions regarding new investment. Additionally, the data collection/authentication/reporting process enables regulators (or those providing regulatory oversight) to engage stakeholders in a process of sector reviews that bring different groups together and help them identify common goals.

The African Water Association's Non-Revenue Water (AfWA) Program provides an example of an initiative that brought different stakeholders together to identify and tackle goals in non-revenue water (NRW) reduction. Specifically, as part of the Further Advancing the Blue Revolution Initiative (FABRI), USAID and AfWA worked with 23 water utility companies in 20 African countries to come up with ideas to tackle NRW. In addition to holding workshops and meetings, one of the first steps consisted on conducting water audits in all 23 utilities in order to develop detailed water balances. As noted by USAID, "this is often the first time that the utility has a comprehensive understanding of how much water it has and how much it uses." (Usher and Reiss 2013). Additionally, this approach allowed for large cost savings without necessitating large investments. Reductions in non-revenue water could often be achieved by improving internal procedures, adding meters at key points, and incentivizing staff to meet key performance

indicator targets. Other improvements emerged from benchmarking exercises and the sharing of best practice experiences.

The key point in considering limited (and inadequate) information is to begin improving data collection and analysis procedures so that future decision makers can build on solid foundations. This article identifies some techniques for data acquisition and authentication and outlines steps for introducing performance targets for countries where basic regulatory institutions are emerging and independently functioning, data is beginning to be used for improved operations, and basic infrastructure services are provided by the state.

It is said that everyone is entitled to their own opinions, but not their own facts. It should be clear that data collection and authentication are essential if one is to document relative utility performance, reward those who are on the efficiency frontier, and identify those who are far inside the frontier. Given the political clout of government owned utilities, including and municipal utilities, the regulator's most important tool involves pressing for transparency: information on trends and relative performance enables public discussions to be based on reality rather than political rhetoric. In particular, public hearings can bring out information regarding performance, business plans, and internal incentives. Performance data reported in utility web pages represents a start, but regulatory oversight is more likely to yield comparative data that provides journalists and citizens with a sense of performance relative to comparable utilities.

2. Governance Models⁴

Data collection, analysis, and dissemination is partly a function of the governance system for the water utility. This section outlines a number of governance models that have been utilized for state-owned and municipal water utilities:⁵

- **Sector-specific national regulator.** Many countries have established a water services regulator with oversight responsibilities for both privately-owned and state-owned and municipal utilities. Depending on applicable laws for a particular nation, the sector specific regulator may be able to issue licenses related to regulatory functions, set performance standards, monitor utility performance (data collection), determine tariff levels and structures, establish uniform systems of accounts (where reporting requirements may differ for large vs. small utilities), arbitrate disputes among stakeholders, perform management audits (and require submission of business plans), develop staff capabilities, and report sector (and regulatory) activities to appropriate government authorities (Marques, 2010). Thus one potential advantage of a sector regulator is the identification of key performance indicators and the accounting/operating reports that enable those implementing policy to set realistic targets and publicize utility performance.
- **Multi-sector national regulator.** Particularly for smaller nations, the multi-sector regulator has some advantages in terms of economies of scale, as well as consistency in the regulatory process and opportunities for learning based on experience with other industries. Such agencies generally have the same types of oversight responsibilities and regulatory instruments as sector-specific regulators. Of course the data issues will differ across sectors, but financial information (including business plans) have common features that can be reviewed by specialists at the regulatory commission (or oversight agency).

⁴ This paragraph and listing draws upon an ECLAC Report, Berg (2011).

⁵ Those models for the United States municipal utilities are taken from Baer and others (2001). Trémolet and Binder (2010) provide another helpful overview of regulatory models.

When national regulators (a single or multi-sector government agency) implement public policy by monitoring and setting rules for another government institution (the utility), those affected by rulings are in a position to go directly to whatever ministry or agency has the water sector in its portfolio or other powerful political actors—evading regulatory restrictions. Furthermore, setting tariff levels is not an effective tool for disciplining poor performance since local managers may find it politically-popular to cut prices (which may already not be cost-reflective). They can cut back outlays on maintenance, where the negative impacts are experienced by future customers (not current voters). Without authenticated information that helps the national regulator set realistic targets and in the absence of credible penalties, the regulator lacks important tools for incentivizing strong water utility performance.

In some cases, the group (or agency) providing oversight is basically a contract monitor.

- **Performance Contract and Contract monitor.** When infrastructure is owned by the municipality (and investment funds also provided by the municipality), there can be a management contract for a public or private entity to operate the facilities. The monitor could be the municipal commission or a committee representing different government agencies. In the case of Uganda, the Ministry of Finance, Planning and Economic Development and the Ministry of Water, Lands and Environment have a performance contract with National Water and Sewerage Company (NWSC) (and its Board of Directors)⁶, with targets for unaccounted for water, billing efficiency, water connections, and collection efficiency. Subsequently, the targets have been revised and internal incentives established for meeting them. Of course, when utility operations are still performed by a GOU, when an external group monitors the performance contract, that group performs a role similar to that of a regulator—though usually with a much smaller professional support staff and with less discretion.⁷ Issues include the bidding process, managing and sharing risk, and instruments available to the contract monitor. The extent of public availability depends on the willingness of the contract monitor to promote transparency.

Several other governance systems are possible at the local level.

- **Municipal department.** For example, the City of Los Angeles, has a Board of Water and Power Commissioners appointed by the mayor, subject to removal without municipal council approval. The City Council determines rates, compensation schedules, property sales, debt issuance, and other aspects of utility operations and investments. The potential for political intervention is substantial: without clear separation from municipal politics, managers face procurement issues, multilayer reporting structures, hiring delays, and other problems (Berg 2011). When a utility is embedded in a municipal department, it can be difficult to identify cost-causation since reported data may be aggregated in ways that make this difficult.
- **Utility reporting to municipal council.** When the utility Chief Executive Officer (CEO) reports directly to the Municipal Commission or Council, the elected members of that council offer the oversight that a sector regulator would provide. Of course, elected officials will be addressing a wide range of local issues and would (generally) lack expertise in water utility issues. This presents potentially severe problems of information-asymmetry. Baer and others (2001) conclude that the oversight provided by the council seems to work for smaller cities. Prices are approved by the municipal council and service quality issues are addressed through public hearings. Of course, it is

⁶ An example of what these contracts look like and encompass is available here: <http://ppp.worldbank.org/public-private-partnership/sites/ppp.worldbank.org/files/documents/Performance%20Contract%20btn%20GoU%20and%20NWSC.pdf>

⁷ Monitoring contracts involves the same types of data and incentive issues facing traditional sector regulators. The strengths and limitations of public-private partnerships are discussed in Marques and Berg (2010, 2011a, 2011b), Jouravlev (2000) and Vergès (2010).

important to have procedures in place that constrain the municipal council from micro-managing the water utility, since that raises the likelihood of politically-motivated initiatives rather than having business decisions based on professional evaluations of options.

- **Strong board or commission: independent municipal agency.** Relatively independent governing boards are utilized in some jurisdictions. In this regulatory structure, the mayor appoints the Board, with confirmation by the municipal council. The Board sets rates and appoints (and removes) the General Manager or CEO of the utility. The CEO is responsible for customer relations, personnel, debt, and utility activities in planning and operations. The Municipal Council determines the transfer to the municipality (corresponding to a dividend to the “owner” of the utility) or the subsidy that might be required for additional investment. In more developed nations, investment funds can be obtained through the issuance of bonds—where capital markets require a substantial amount of data collection and transparency. Capital markets provide another external check on potential excesses of managerial discretion by providing another set of stakeholders concerned with utility efficiency and financial sustainability. The utility’s track record and prospects determine its bond rating (affecting the interest rate).
- **Municipally-owned Corporation.** Like the strong board model, the Board of Directors (appointed by the mayor, often with municipal council approval) would oversee the utility, operating a separate personnel system. In South Africa, the Board represents the municipality (sole shareholder) and has the power to approve rates (see SALGA, 2011). The effectiveness of that oversight is highly dependent on having a Board that is not directly engaged in political processes. Professionalism and requiring thorough reports from management is unlikely to occur if the mayor views the utility as a source of political patronage.
- **Municipal utility district.** For example, the Sacramento Municipal Utility District in the United States has an elected seven member governing board, with managerial authority delegated to the CEO. This governance framework resembles that of cooperatives, where customers are “members” and voters. The governing board then provides oversight of utility activities (Baer, 2001). Again, the degree of professional oversight is highly dependent on the governing board requiring audited data and taking a long term view regarding utility performance.

In each of the approaches presented above, the variance within a category can be great, so it is difficult to fully outline the range of regulatory authority for different types of regulation. Suffice it to note that there is oversight by some authority, the water ministry, a national regulator, or a municipal commission. The key issues are related to how these institutions make information available, implement incentives, and evaluate performance. It should also be noted that local regulation often lacks the expertise to overcome information asymmetries and the transparency required to promote citizen participation. In particular, without some form of national or regional⁸ data collection, it is difficult to make performance comparisons. That implies that decentralized provision of water services is especially vulnerable to limited information regarding performance trends.

3. Information as a Tool⁹

Information (when publicized by political leaders or the press) can help mobilize public opinion and begin to hold government ministries or municipal boards accountable for sector outcomes. If funds to municipalities are being provided by the central government, then other claimants of sector support (education, health, transportation, etc.) will document the impacts of investments in those sectors. Both national development banks and private investors focus on the likelihood that funds will be used productively, providing social (and

⁸ Several regional data collection initiatives are currently taking place with the assistance of NGOs. These include the World Bank (for the Danube region) and USAID (for non-revenue water in Africa).

⁹ This section draws upon Berg (2011),

private) returns on investments. International donors should apply similar standards to avoid wasting scarce capital and to provide incentives for utilities to move towards best practice. However, without facts, investors and donors are in no position to supply funds for the most productive infrastructure initiatives. National development banks and government budgets have other uses for funds as well—for education, hospitals, and roads. Without evidence of good performance in water services, other claims on scarce government resources are likely to be more compelling. In addition, allocations across sectors also consider evidence regarding the direct and indirect benefits associated with expanded water services. Four areas are particularly important:

- **Public information:** Making information available to the public promotes better performance. Customers' awareness of baselines and trends improves their understanding of what is feasible and can put citizen pressure on managers. If the utility is municipally-owned, data on trends for KPIs can direct attention to utility management in local political campaigns. For national or state-owned water utilities, the availability of comparative information can be used by political challengers as evidence of mismanagement. One rationale for public ownership (if not operation) is that water services are such important components of life: access to water services is a human right. At the same time, water services are commodities: if managers are driven completely by short term political considerations rather than commercial concerns (and financial sustainability), then the utility becomes a stagnant institution with low quality, high cost service. Even if the tariff is low, the system is likely to be financially and environmentally unsustainable; the business plan will be inadequate to meet the needs of citizens over the long term. Service delayed is service denied. Lack of cash flows today mean that the children of current customers (and those who are not served) will face higher costs and prices in the future since the network will not be maintained and appropriate water sources will not be developed.
- **Managerial information:** Small companies and entities need support to obtain and to use data for benchmarking purposes. Such data is first and foremost a managerial requirement—managers can only manage what they measure. Records document what has happened in the past: those data provide a baseline for future developments. Without underlying income statements, balance sheets, and operating statistics, feasible business plans cannot be developed. In highly decentralized utility systems, the lack of managerial capacity and absence of up-to-date information systems serves as a brake that delays performance improvements. With hundreds of municipal utilities, effective oversight by a national regulator is very problematic (given the difficulty of obtaining timely and consistent information and applying sanctions) (Jouravlev, 2004; Vergès, 2013). Local regulation by the municipality has its own set of problems: lack of expertise (and sometimes authority) for evaluating performance. Small utilities lack scale economies and the engineering expertise necessary for good planning and operational efficiency (Ferro and Lentini, 2011). In addition, the politics of local control (and excessive managerial turnover) limit the professionalization of top management. The evaluation of business plans and past performance is one regulatory activity that can put pressure on GOUs to improve performance.
- **Performance benchmarking:** Regulators should use benchmarking as part of tariff review;¹⁰ it can be used as a yardstick for comparing the performance of similar utilities. While comparisons using limited data can be problematic, many countries have utilized benchmarking techniques to set targets and reward good performance (for a group of comparable companies or service divisions) (Berg, 2010). Penalizing weak performance is difficult in the case of GOUs, since reducing tariffs will not put pressure on management. However, getting “league table” information (performance

¹⁰ One benchmarking toolkit is available at <http://www.ib-net.org/>, the International Benchmarking Network. Another World Bank portal is <http://ppp.worldbank.org/public-private-partnership/>, the Public-Private-Partnership in Infrastructure Resource—with material on legal frameworks and links to tools for operators and policy-makers. Also see <http://www.sswm.info/>, a Sustainable Sanitation and Water Management Toolbox. These resources all emphasize the collection, authentication, and analysis of data.

indicators and rankings) out to customers, the press, and to donors does change the information set available to important stakeholders. If the regulatory agency has the political independence (and leadership) that enables it to be an advocate for efficiency, a poorly performing system can be transformed—as external stakeholders put pressure on management. Bonus pools (from national or local budgets) can be distributed based on relative performance, providing an incentive for managers to apply greater effort towards cost containment and service quality improvement. If investment funds are allocated (in part) using the same criteria, there is likely to be more public pressure for better performance and more interest on the part of institutional owners.

- **Data timeliness, consistency and accuracy:** One important step for an agency is its adherence to schedules. If stakeholders are fully aware of deadlines and the penalties of missing deadlines are substantial, then the GOU is more likely to operate as a commercialized entity rather than a politicized organization. This means, of course, that the water allocation authority, the finance ministry, and other relevant government authorities must back up the regulatory commission that sets performance targets, prices, and oversees service quality issues. If utility managers do not meet deadlines, the ministries should take appropriate actions to replace the current utility Board of Directors. In the case of municipal utilities, if funds from the national government are being allocated to utilities for investment, funding could be contingent on replacing managers. It should be clear that internal governance is crucial for the improvement of data quality. Of course, improvements cannot be instantaneous, but they should be documented. Relevant decision-makers from accounting and information systems need to be included in the process to promote both accountability and sound business practices. Of course, it should be recognized that in many developing countries neither the water resource management agency nor the sector regulator has the budget, staffing, and legal authority to operate in ways that very effective. However, in both cases, the fledgling agencies can at least strive for transparency, clear schedules, consistency in decisions, and accuracy to the extent that resources allow. These same points apply to environmental protection agencies that have oversight regarding wastewater treatment and industrial discharges affecting the sustainability of water sources.

4. Information Strategies for Regulating GOUs

Several examples from rural and urban water utilities are presented below to illustrate the limited (but potentially effective) range of strategies available to agencies (or Ministries) tasked with providing oversight.¹¹ First, people matter: leaders need to recognize the value of beginning a data-collection initiative and professionals must be ready to assist in the process. That generally requires local capacity building. Once data are available, decisions about incentives and targets can be evidence based—reflecting economic and social reality rather than political rhetoric. So measurement is central to performance-oriented management, but also to sound regulation. In situations where the regulator lacks tools, requiring utilities to submit business plans represents one way to document the consistency of utility objectives (targets) with current revenue and investment projections. Ultimately, lack of data needs to be publicized, but only as a last resort. Figure 1 identifies six strategies for improving sector performance. The authors are aware of no research proving that the strategies are *necessary* for improving sector performance, nor that they are *sufficient* for the achievement of better outcomes in the water sector. However, case after case in the literature suggests that data collection and analysis are

¹¹ Additional lessons and more extensive discussion of the points developed below are available at <http://regulationbodyofknowledge.org/launching-or-revitalizing-regulatory-systems/> in the FAQ on setting targets when there is limited data availability.

associated with the revitalization of water utilities. The strategies identified below are not presented as representing a unique sequence that must be followed. Rather, they have proven useful in a variety of circumstances (where some mini-cases provide evidence regarding the strengths and limitations of the elements supporting specific strategies). Note that not all stakeholders will support increased data availability—either due to resource constraints, organizational cultures that thrive on information silos, or political actors that benefit from current institutional arrangements that do not emphasize data-driven decision-making.

Figure 1: Stakeholders and Strategies for Improving Performance



Identify Local Leadership: Collecting data from multiple, dispersed, low-capacity operators serving small communities is challenging. Regulators can work to increase the value of data collection to the local leadership and community. Information about customers, delivered output, cash flow, and other indicators is essential if citizens are to be in a position to evaluate whether their project is moving in the right direction in terms of service quality, access, and sustainability. Local capacity in financial management may be lacking, but recruiting and training people to collect, authenticate and report data is essential for the long-term success of small, local projects (as well as for larger utilities) and provides the foundation for future expansion and improvements. Even a simple business plan establishes operating parameters and targets that can be reviewed at the end of each period. Without such plans (plus associated procedures and a clear organizational chart indicating roles and responsibilities), the project can flounder and not meet citizens’ expectations.

Promote Local Capacity Building: Government and development-partner funding for capacity building can have substantial leverage. These groups often provide financial resources for creating facilities in conjunction with local operators, community partners or non-governmental organizations. Part of such initiatives should involve ongoing data collection for a few key variables. Such projects require some record keeping in a common format, such as accounting for external funding and identifying sources of internal funds and outlays for operations and investments. Recent initiatives emphasize leveraging access to mobile phones and information and communications technology (ICT) to enable even limited capacities in data collection and analysis; when this happens, trends can be identified and future support can be targeted to groups that are able to document the effective use of resources to meet community needs.

Senegal's rural water systems illustrate how underperformance by community user groups in managing rural water systems has triggered a reform initiative that is moving operations to PPPs, with community organizations (Association des Usagers des Forages [ASUFORS]) serving as monitors and supervisors. When the ASUFORS was responsible for delivery, management was weak and did not "handle important issues such as the recovery of operating costs, appropriate tariffs and pricing, and renewal of infrastructure" (Diallo 2015). Furthermore, no separation of user representation from governance and operations was seen, leading to the unsustainability of the local systems. The case illustrates the need both for capacity building and for appropriate design of accountability mechanisms within a sound system of governance. One result of weak performance was a renewed emphasis on a shared information system to facilitate performance updates and yard-stick comparisons.

Of course, not all capacity-building initiatives yield sustainable results. Egypt has benefited from capacity-building programs sponsored by USAID (as a development partner). An evaluation of those programs indicated that the organizational culture sometimes limited the impact of professional training programs. In addition, obtaining quantitative measures of program impacts is particularly challenging when external developments constrain or boost the application of new technical skills (Skilling, Kolb, and Youssef, 2012).

Assess Data Accuracy and Reliability: Once the data have been obtained, it is important to assess their accuracy and reliability. Highly accurate and reliable data will allow people to make meaningful assessments and comparisons among utilities (or for the same utility over several years). Reliability is defined as confidence regarding how the data were gathered. Accuracy indicates the data's likely range of error or uncertainty. It is good to be aware that inaccurate, unreliable data should not be used for developing targets or designing incentives. In Entebbe, Uganda, data metering measures were implemented to reduce non-revenue water involving data accuracy and reliability. These included: regular spot checks on large customers, rotation of meter readers every 6 months, a meter/age database which allowed them to replace old meters first, and universal metering of all customer accounts. This resulted in improvements in their non-revenue water situation (USAID 2010).

In Nigeria, state water utilities demonstrated weak performance over the years, and a major reason has been their inability (or unwillingness) to collect, store, and report data for critical decision making. As a result, the Federal Ministry of Water, in conjunction with development partners, recently introduced all state water agencies to the International Benchmarking Network (IBNET) system and has encouraged data collection using a basic set of KPIs. Initially, data quality was a major issue, but the culture of data collection is gradually becoming entrenched. This program is designed to promote higher operational efficiencies though the effectiveness of data alone (without incentives for meeting targets) is limited (Macheve, et. al. 2015).

Develop Targets and Incentives: Data, organized in patterns, if carefully analyzed and interpreted, yields insights that can be used to develop realistic targets. Situations characterized by relatively low per-capita

income; inadequate capacity for both monitoring and operating infrastructure systems; lack of social cohesion; and limited institutional frameworks present substantial challenges for those seeking data about sector performance. If no historical record exists regarding financial and operating statistics, then no starting point can be identified to use as a baseline for gauging the impacts of external or internal targets and incentives. Generally some numbers are available, but the data are likely to be uneven in quality and not very timely. In such situations, targets will have to be based on comparable utilities in other regions or countries. In public-private partnerships, establishing the baseline is often part of the contract's first key deliverable, and on the basis of a pre-defined material difference, some contract terms may be amended. Similar flexibility may need to be built into a licensing regime. However, the primary task for those providing oversight involves initiating a data-collection program, so baselines (and targets) can be established. For example, in Pakistan, monitoring of the Punjab water access project by Community Based Organizations (CBOs) included baseline data collection which enabled them to calculate a 90% reduction in reported water-related diseases, an averaged increased household income of 24%, and as much as an 80% increase in school enrollment of children, after the project was implemented. All of these statistics became available thanks to a benefit and evaluation biannual report, a requirement of project funding (Blume, 2004).

Document Measurement and Management: If there is no evidence of measurement, then one has to question whether those in positions of authority are actually managing infrastructure operations. The first question to ask when trying to identify baselines and targets is: "Why have reports in the past been so lacking in information?" Managers responsible for making operating and investment decisions are also responsible for collecting data. They may have weak information systems (because of excessively low revenues relative to operating expenses), or they may fear that the provision of data will negatively affect their position. If quarterly or annual reporting is not done, the existing governance system is ineffective. Several explanations can be given for data gaps: (1) the group with oversight responsibilities (a ministry, municipal council, or regulatory commission) lacks either the authority, political will, or motivation to "extract" data from the operating company (that is, regulators are part of the problem); (2) the managers need training in the fields of accounting, finance, data acquisition, and data analysis; (3) the operator has limited funds and information systems are a low (short-term) priority relative to other tasks that must be performed.

Require Availability of Business Plans: An infrastructure provider without a business plan is like a delivery truck without an address or a map.¹² Thus the absence of a business plan is evidence of weak management. In particular, attention needs to be given to the cost-accounting system, which is central to whether targets can indeed be met within current financial constraints. Data can be analyzed using an Excel spreadsheet, and then the internal rate of return can be compared with the cost of capital; inconsistencies would suggest that the targets are unrealistic in terms of their values or timing. Taxpayer/citizens are the ultimate owners of government-owned utilities, so information about expansion plans, service quality, and other elements is necessary if citizens are going to understand whether they are getting value for their money.

The water regulator in Peru (SUNASS) initially had few instruments for incentivizing municipal water utilities to improve performance (see Corton 2003, 2011). Benchmarking is one tool SUNASS has used very effectively to identify strong and weak performers. Additionally, the law required utilities to submit business plans to SUNASS for review and approval. This provided the sector regulator with data on current and projected financial data (including collections and cash flows), operating variables, and targets. Over

¹² We thank a dedicated reviewer for suggesting this metaphor.

time, achieving targets has become part of the organizational culture for many of the water utilities SUNASS supervises. Getting the business plan into the public domain greatly improved the transparency of municipal utilities. Similarly, the Peruvian regulatory agency monitoring investment and operations in energy and minerals (Osinergmin) presents a vast amount of information on its web site. It promotes capacity building and plays a role in developing (as well as implementing) public policy through the provision of advice and studies to those setting public policy.

5. Concluding Observations

It is said that “the fewer the facts, the stronger the opinion.” This suggests that data and supporting analyses might defuse some potential conflicts when one government entity regulates another government entity. Decisions based on managerial discretion and political pressures characterize settings where data are not systematically collected. Evidence-based decisions cannot be made without historical statistics on finances (cash flows, income statements, and balance sheets) and operations (inputs, delivered outputs, service quality, customers, etc.). Therefore it is important to publicize information about trends over time and performance patterns across suppliers. Ultimately the question of data availability and data quality relates to how well inputs (networks, maintenance, labor, etc.) are translated into outputs (infrastructure services that are delivered to residences, industrial customers, and commercial demanders). Without financial and operating statistics, it is difficult (if not impossible) to evaluate sector performance and to identify the strengths and weaknesses of current regulatory and managerial arrangements. This observation implies that there is a need for a permanent regulatory effort related to data collection and verification; the operating utility needs to invest in robust information systems if managers are, indeed, going to manage.

Nevertheless, those developing and implementing public policy should not begin in an adversarial relationship with current operators. Rather, the guiding coalition that is responsible for new initiatives needs to determine the reason for non-reporting and take steps to remedy the situation. In preparing a reform initiative, the coalition will need to be able to quantify the existing performance of infrastructure suppliers, so some preliminary data collection is required. A collaborative workshop that focuses on current information systems could serve as a catalyst for getting high-level managers to review their information systems. Lower-level managers often operate in data silos, where the individual with access to data uses this exclusivity to gain favors or just to experience the sense of power that accompanies “control.” To establish credible information systems broad political support must be mustered for improving efficiency in the provision of infrastructure services.

Up-to-date, consistent and audited information and citizen awareness of trends in water utility performance can alter the content and tone of public discourse. When utility business plans are brought under technical scrutiny, decision-makers are forced to confront reality. Realistic targets (and associated managerial incentives) are totally dependent on having timely, reliable, and consistent data on KPIs. When robust comparisons across utilities are available, politicians and managers are more likely to be held accountable for outcomes affecting the health and welfare of citizens, efficiency in the provision of water and sewerage services, and the long term sustainability of water as a valuable natural resource. Of course, again the utility’s Board of Directors becomes a key component of the governance system. If the Board is politically-driven rather than motivated to track and incentivize good performance, then the system lacks the good (internal) governance essential for monitoring management. That leaves the role of external governance (via regulation) with one less ally in the fight to improve utility performance for state-owned and municipal utilities.

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