Water Utility Performance in Central America: The Political Economy of Coverage, Quality and Cost

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Abstract

Performance indicators for water utilities in Central America do not give much reason for celebration. Data are sparse, suggesting a lack of transparency and public awareness regarding relative performance in the region. The resulting information asymmetries limit pressures for reform and can contribute to dysfunctional social conflict. This chapter describes four sources of conflict in the design and implementation of water policies: authority conflicts (reflecting jurisdictional disputes over who has the last word), cognitive conflicts (based on technical disagreements regarding the analysis and interpretation of performance data), values conflicts (involving ideological differences or differential preferences for sector outcomes), and interest conflicts (where different groups—utilities, customers, unserved citizens, regions, and unions—benefit or lose, depending on the decision). Using data from Costa Rica, El Salvador, Guatemala, Nicaragua, and Panama, we survey the Central American experience. The study suggests strategies that might be adopted to promote conflict resolution and to improve water sector performance in the region, particularly with regards to universal service, service quality, and cost containment.

The purpose of this paper is to examine the political economy of water utility performance in Central America, focusing on coverage, service quality, and cost. The study presents comparative data and describes the forces shaping access to water and sewerage in the region. The fundamental problem facing citizens and policy-makers in these nations is the lack of comprehensive performance comparisons within and across countries. Yardstick comparisons could provide tools for creating incentives within water utilities, information on outcomes for holding decision-makers accountable, and rankings that could give citizens realistic indicators of relative performance. Without transparency regarding decision processes and data on performance outcomes, political leaders can make promises that are not grounded in reality.

1. Benchmarking to Document Sources of Inefficiency

If actual sector performance were meeting global expectations, new water initiatives would not be a high international priority. However, to meet the Millennium Development Goals for Water, benchmarking is an essential tool for improving service quality, expanding networks, and optimizing operations. Although water ministries, national regulators, and managers are aware of the importance of data collection and analysis, they sometimes lack the incentives and/or the professional staff able to conduct analyses. Ideally, the water sector regulator would review productivity studies and create performance incentives to achieve policy objectives. However,

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without confidence in the measurements, those responsible for creating incentives will not risk their credibility by instituting rewards or applying penalties. Regulators will be unwilling to apply incentives based on performance unless they are very confident that the rankings can survive challenges. Furthermore, developing incentives to promote efficiency in state-owned enterprises is particularly difficult, given traditional salary structures and the role of local politics in municipal utilities. In addition, in some cases, regulators and policy-makers may wish to avoid the political pressure generated when poorly performing utilities are singled out. "Knowledge is power," and providing information to stakeholders disturbs the *status quo*.

1.1 Rent-Seeking and Fairness: In his overview of the economics of urban water systems in low-income countries, Noll (2002) identifies "the four main components of a water utility: the private supply cost of water delivery to various types of customers; the demand for water by major customer groups; the externalities associated with urban water delivery and use; and the market and political institutions that allocate water among competing uses" (p. 43). In his concluding sentence, he notes that although decentralized distribution has "higher private costs than piped distribution, conceivably its relative costs would not look so bad when one takes into account usage externalities and regulatory distortions" (p. 62). While the debate over centralization vs. decentralization of water utilities has not been resolved, it is clear that water utility performance is affected by information asymmetries. Without a centralized system for data collection and authentication, policy-makers will not have the information needed to evaluate policies. In addition, the lack of transparency facilitates political interference and allows poor management within the sector: both contribute to weak performance.

After outlining concepts from the political economy of urban water systems, Noll concluded that this industry is characterized by two features that contribute to problematic perfromance: a high ratio of fixed (sunk) to variable costs and a high ratio of external effects to private costs. The first feature leads to political presssures to reallocate the rents (a significant proportion of utility revenues) to various stakeholders, including unions, contractors, and politically favored groups. The second feature can result in externalities determining optimal pricing and investment—though the actual decisions may be far from optimal, given government opportunism. These externalities could be through two channels: environmental degradation of groundwater due to poor sewerage coverage (and weak monitoring of industrial discharges) and health impacts (through water-borne diseases). In addition, there is a fundamental "social fairness" concern, where inadequate attention may be given to access by the very poor.

Thus, universal access to safe water is a political objective that resonates with citizens. For those valuing "distributive fairness," water is a human right, not a commodity. However, "procedural fairness" is another value—one that emphasizes citizen access to reliable information, promotes consistency in decisions, and takes into account the viewpoints of affected parties. Both notions of fairness are relevant when considering the legitimacy of social arrangements promoting universal access. The provision of water service requires investments and operating outlays; thus, the financial sustainability of arrangements should be given prominence. Since water is a commodity that is symbolically linked to human dignity and health, operating efficiency, service quality, and citizen access become key performance indicators. However, current price structures in the region seldom target those with greatest need and expansion plans do not meet income distributional concerns.

1.2 Low Level Equilibrium: In their classic survey of the provision of water services in Latin America, Savedoff and Spiller (1999, p. 1) describe the outcome as a "low level equilibrium [where] low prices are reflected in low quality, limited service expansion, operational inefficiency and corruption, which further erode public support." Government is perceived as part of the cycle of inefficiency and citizen skepticism: revenues may not cover operating costs; in addition, investments primarily occur when the national development bank, water ministry or donor agencies make funds available. However, the investments are not maintained, leading to leaks. Service is poor, leading to nonpayment (high number of noncollected bills). No financially sustainable business plan exists. Under-performing water utility managers are not replaced. Essentially, consumers pretend to pay for the service (where prices are low), and producers pretend to supply the service (where quality is low and network expansion is slow).

Based on their studies of a number of Latin American countries in the 1990s, Savedoff and Spiller strongly recommended (1) corporatization of utilities (treating them as enterprises and not as govenment agencies), (2) disaggregation of utilities and the promotion of competition, (3) regulatory frameworks that limit government discretion, and (4) privatization (emphasizing domestic ownership). Whether all those strategies are feasible today is questionable. The current study places much greater emphasis on the role of information and benchmarking.[2]

Policy-makers from the legislative and executive branches of government are potential consumers of information. To some extent, the absence of benchmarking information takes pressures off policy-makers because citizens are unaware of performance trends and the extent to which utilities fall short of best practice. However, since public investments in water systems mean less funding is available for hospitals, schools, and other social infrastructure, citizens want to be sure that water utilities are performing well. Otherwise, politicians can posture, utilities can pretend to supply water, and consumers can pretend to pay. Ultimately, the outcome damages all three groups: unserved citizens become frustrated with political rhetoric, managers have job security (but little potential for growth), and customers receive poor service. Information can be a catalyst for reform.

Analysts agree that benchmarking represents an important tool for documenting past performance, establishing baselines for gauging improvements, and making comparisons across service providers. In the water sector particularly, valid comparisons contribute to improved performance. Rankings can inform policy-makers, the providers of investment funds, and customers regarding the cost effectiveness of different service providers. There are many audiences for yardstick comparisons, each with different degrees of expertise and interest when it comes to evaluating water utilities, yet each has an expectation shared by the others: rankings should reflect reality. Results that are highly sensitive to model specification or the inclusion (or exclusion) of particular variables and data points will not be credible. If the criterion of consistency is not met, these groups cannot be confident that the relative performance indicators are meaningful. Thus, if alternative methodologies do not yield broadly similar rankings,

[2] Even for a consolidated system, there is no reason not to report data by region. For example, Uganda has a single state-owned (aggregated) enterprise, but the National Water and Sewerage Corporation publishes benchmarking information on each municipality and utilizes yardstick comparisons to establish performance targets and to reward managers (Mugisha, Berg, and Muhairwe, 2007).

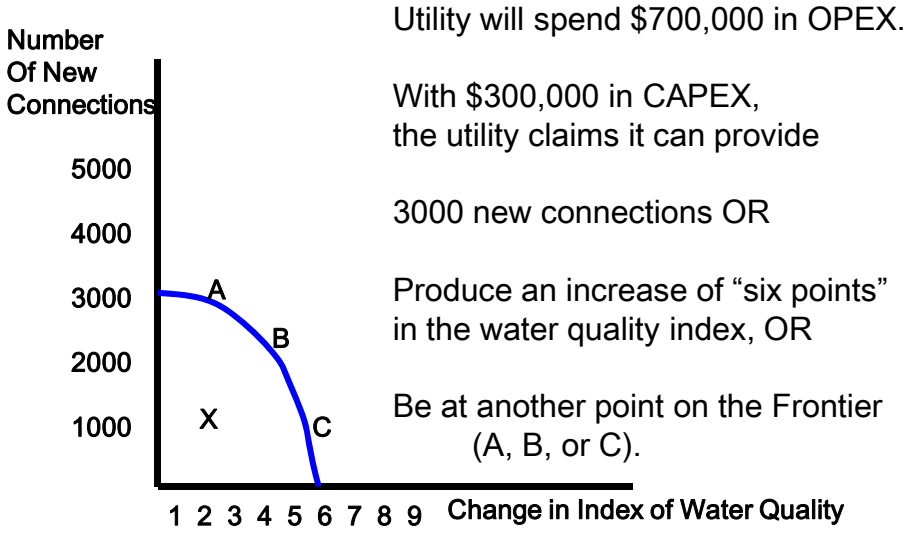
analysts should be able to explain the discrepancies. Citizens are not well-positioned to evaluate conflicting claims, which puts a heavy burden on those producing utility performance ratings.

This study gives particular attention to the market and political institutions that influence investments and operating efficiency of state-owned utility enterprises—the dominant supply option in the region. The next section introduces different types of conflict to illustrate why outcomes in water can be suboptimal (Berg, 2007). It is important to understand the sources of weak performance. After exploring why a suboptimal *status quo* involves conflicts (using a stylized characterization of trade-offs and information asymmetries), the paper turns to actual performance in Central America. The study identifies some strategies that could promote conflict resolution and improve water sector performance in Central America.

2. Resolving Conflict: Identifying Trade-offs

Economic theory and experience suggest that information, incentives, and institutions all affect sector performance. Producers, consumers, and policy-makers base decisions on their own values (preferences), the information they possess, and the budgetary and technological constraints they face. To illustrate the choices facing decision-makers, we will take a hypothetical case involving water coverage, water quality, and cost containment. A Water Utility already has a distribution network that reaches many citizens; it plans to spend $700,000 in operating expenses (OPEX) for the year. Based on the cash flow budget, utility managers claim that they have $300,000 available for capital expenses (CAPEX). These capital investment funds can be used to expand the network to reach unserved citizens or to improve the quality of the water delivered to those currently receiving service. The frontier available to the utility manager is depicted in Figure 1 below: where 3,000 new connections can be made (at a cost of $300,000) or the index of water quality can be improved by six points (this index could involve a percentage of the water that is chlorinated before going into the distribution system, or it might reflect water continuity—the number of hours per day for which service is available). Note that the frontier includes points A, B, and C—combinations of increased coverage and improved water quality. If the frontier is feasible, but the utility is only able to achieve point X with the available $300,000, we could conclude that the outcome is suboptimal.

Figure 1:
Resolving Conflict and Making Choices



If the utility invests and achieves the outcome associated with point X, we would say that the managers are inefficient. Of course, managers might dispute that conclusion, arguing that geography, topology, changes in input prices, problems in revenue collection, or other developments make the old frontier infeasible. They could claim to have better information about the true trade-offs (and production possibilities) they face. Their claim illustrates the possibility of disputes among stakeholders regarding what is possible.

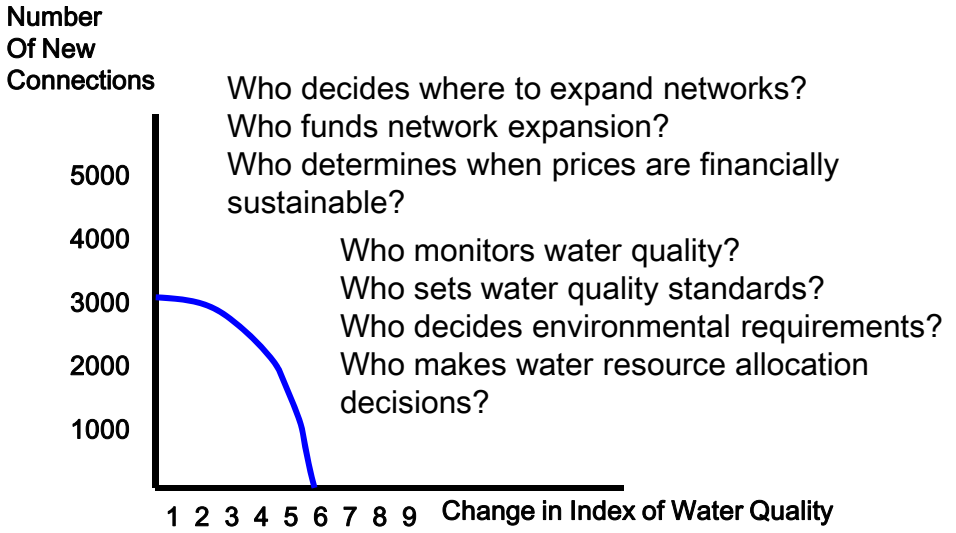
In general, there are at least four sources of conflict: (1) who should make decisions, (2) what *can* be done (as illustrated above), (3) what *should* be done, and (4) who should benefit from decisions. Let us examine these sources of conflict—all illustrated in Figures 2 through 5 below. These conflicts can be placed into four categories (Shabman, 2005):

1. *Authority Conflicts*: reflecting a lack of clarity of roles among various jurisdictional decision-makers;
2. *Cognitive (Factual) Conflicts*: stemming from disagreements regarding current or historical facts and causal linkages;
3. *Values Conflicts*: due to conflicting priorities and different weights on outcomes;
4. *Interest Conflicts*: when stakeholders benefit differentially from different managerial and policy choices (stimulating rent-seeking activity).

2.1 Authority Conflicts: The first conflict involves jurisdictional disputes: does the decision rest with a government ministry, a municipal government, a sector regulator, or the water utility? Depending on the decision, each of these entities could have authority. If decision authority is in dispute, the result is bureaucratic in-fighting and finger-pointing. Even when responsibilities are clearly identified, disputes can arise. For example, a water ministry will set policy—such as

coverage targets, but the finance ministry (or a national development bank) might have control over investment funds. If the $300,000 in our example is not made available for capital investments, then the utility may have to seek higher prices or funds from some international donor. If the utility is supposed to meet the network expansion target, but funds are not available, who is responsible for the missed target? Similarly, the local municipality may have zoning rules or city expansion plans that call for growth in one geographic area, but the utility can meet its target by extending service to a different set of citizens. Who has final authority? What if the city council's preferred 3,000 additional connections cost more than an alternative network expansion (of $300,000) because particular streets have to be torn up and a set of politically powerful land owners benefit from this alternative? Another conflict arises if the sector regulator allows higher prices to finance the investment, but politicians want to keep prices low (or even below-cost). Other authority conflicts include who sets and monitors water quality standards (and whether the cost implications of these standards are factored into the decision) and who is responsible for water resource management? If a water utility must utilize high cost water pumped from a distance while local agricultural interests obtain water for free, water resource managers are making decisions that have implications for the financial sustainability of the utility. Figure 2 identifies some of the jurisdictional disputes that complicate decision-making in the water sector:

Figure 2. Authority Issues Facing Regulators



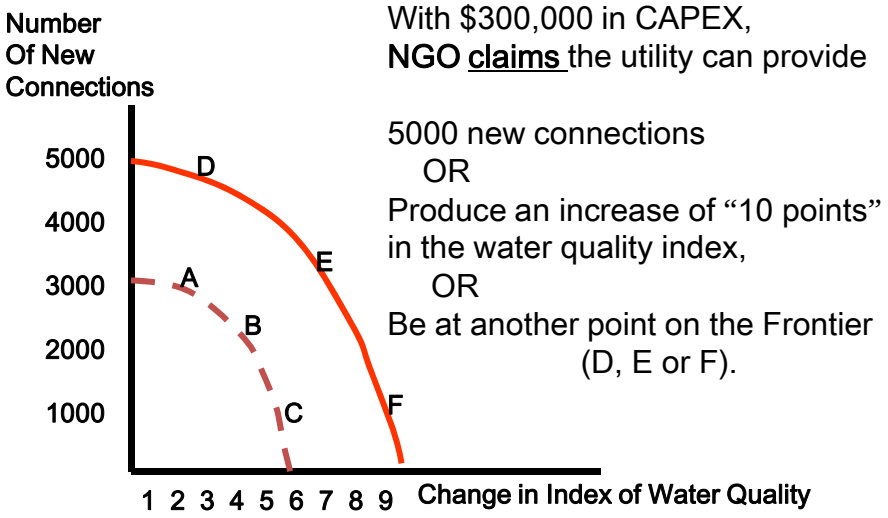
Resolution of these conflicts involves a number of potential strategies: changing the law (to achieve legal clarity), cooperating with sister agencies (to avoid turf wars), establishing task forces to address issues (to promote collaboration), educating the courts about new institutions, promoting transparency in regulatory processes, and improving appeals procedures. Authority/jurisdictional issues are basically political issues, and need to be addressed in that context. However, the issues illustrate the complicated problems facing sector regulators—some conflicts can only be resolved through legal challenges and new laws. Here, the role of the water regulator is to provide expert advice, leaving politicians to address (and balance) the political issues. Of course, when regulators have some discretion, agency rulings begin to resemble

"policy" so water regulators often do more than "implement" policy established by the legislature or sectoral ministry.

2.2 Cognitive (Factual) Conflicts: A second source of potential conflict is disagreement over "what is." For example, a non-governmental organization (NGO) might argue that the utility has not reported correctly what is possible with the $300,000. The NGO could claim that management is overstating the costs of providing new connections and of improving service quality. This situation is depicted in Figure 3 below, where the NGO asserts that 5000 new connections could be provided. Such a dispute can be resolved when there are adequate data. In particular, benchmarking studies (based on time series and cross-section data) can link inputs to outputs for a group a comparable water utilities. Best practice can be determined: if a utility is not operating on the frontier, sound systems of governance will result in pressures on management for performance improvements.

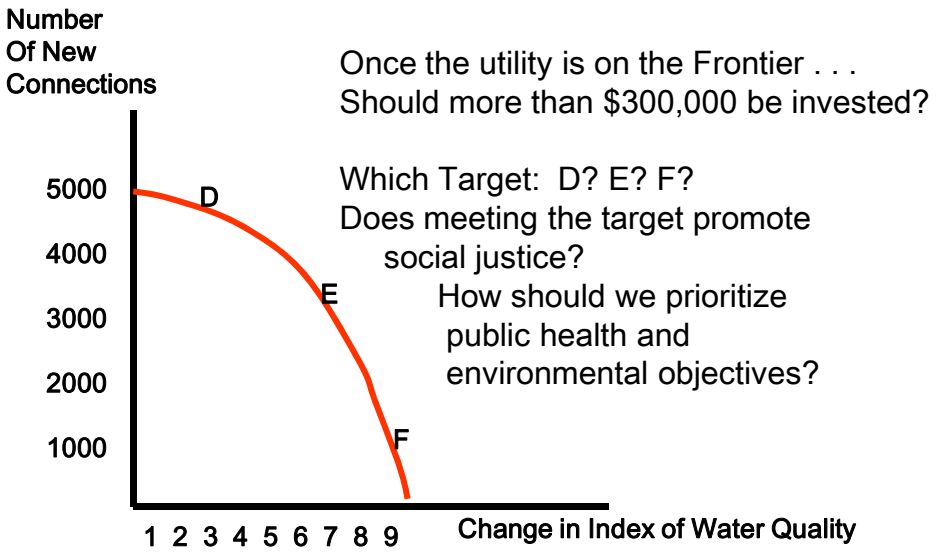
For a state-owned enterprise, the appropriate ministry would initiate management shake-ups. Of course, such responses presuppose both the availability of information and sound organizational incentives, including holding decision-makers accountable for failure. It is said that managers can only manage what they measure, so lack of income statements, balance sheets, cash flow statements, and operating statistics would be evidence that the utility is likely under-performing. Resolving the kind of issue depicted in Figure 3 below requires data. When such data are unavailable, one might legitimately place the burden of proof upon management: requiring managers to demonstrate that they are indeed operating at best practice. In some regulatory jurisdictions (like Chile), a model firm (based on engineering models) is used to rank the performance of utilities. In general, without some facts, one cannot gauge trends, compare current operations across utilities, or establish reasonable targets. On the other hand, if a regulator is able to make yardstick comparisons, information asymmetries are reduced.

Figure 3: Factual Issues Facing Regulators



2.3 Values Conflicts: Different priorities mean that some groups place different weights on particular objectives and outcomes, given their values (preferences for different outcomes). For example, one group of citizens could view network expansion as promoting population growth, when the region is drawing down the water table. Sensitive ecological areas might be destroyed as water is diverted to meet urban water demands. Citizens with such concerns would prefer that water quality be improved for those currently receiving service. Until the community is ready to address environmental issues, these citizens would not want new connections (with the associated higher water usage). On the other hand, citizens who place a great weight on social justice might prefer rapid network expansion, so the unserved families have access to improved water sources. Such conflicts are political in nature—where the values of various constituencies differ. Their resolution depends on the degree of public consensus over social objectives, and how that consensus is translated into law in the legislative arena. Public education can help the various parties better understand the trade-offs, perhaps clarifying what is being given up to achieve particular objectives. In some cases, such discussions might identify win-win options, where goals are achieved via the introduction of additional options. One such option would involve increasing the budget available for water-related investments. Figure 4 illustrates three potential targets if the NGO is correct about the feasible combinations of connections and quality with a $300,000 budget.

Figure 4: Values Issues Facing Regulators



Values conflicts are often hidden when stakeholders divert attention to debates over hypothetical outcomes or to what are (truly) infeasible outcomes. An NGO concerned that network expansion (new connections) would unduly stress water sources could direct public attention to that issue or it could cloud the debate with references to public health improvements associated with water quality. Rhetoric can become a substitute for critical thinking if the participants are unwilling to engage in dialogues that help everyone understand the concerns of various parties to the dispute.

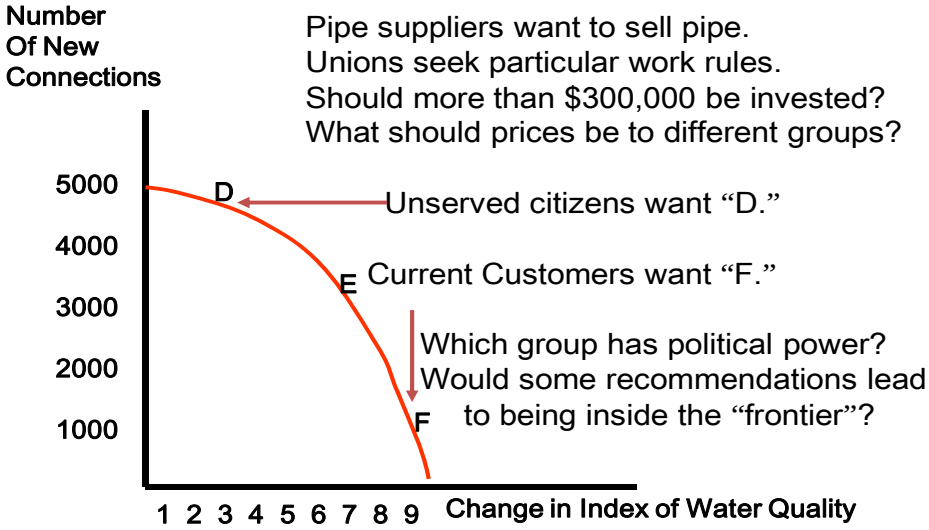
For example, the debate over public versus private ownership of water utilities often has a purely ideological flavor, without reference to the actual performance of actual utilities under different ownership arrangements. Without information regarding what is possible (in terms of operating efficiency) or what sources of investment funds are actually available, the public debate creates heat but sheds little light on the issues. Highly vocal citizens (or international donors) remain emotionally committed to particular arrangements or policies, with a minimal grounding in reality.

2.4 Interest Conflicts: The Political Economy of Regulation sheds light on the relationship between stakeholder power and sector outcomes. Theory and empirical studies suggest that public policy can be unduly influenced by well-organized special interests engaging in rent-seeking activity (Stigler, 1971). Consider a situation where the beneficiaries of a policy decision are few in number (concentrated) and politically powerful. They are aware of the consequences of a particular ruling. In this situation, the losers experience low individual costs (that are still substantial in aggregate); however, members of this group are difficult to organize (or do not recognize the long-term impacts of the decision). The result is a policy that benefits well-organized stakeholders, even when the costs to losers outweigh the benefits to winners.

For example, in the situation depicted in Figure 5, customers receiving service understand the current water quality (and its implications for their comfort and convenience). They will benefit from capital expenditures that improve the water treatment plant. The unserved citizens will prefer network expansion. However, those without service may lack political power and are unlikely to be unaware of investment options facing the utility. Clearly, the ultimate decision has differential impacts on various stakeholder groups. The situation here is depicted as a zero-sum game since the binding constraint is the $300,000 in capital investments.

Other examples of interest conflicts include those suppliers benefiting from one or another decision: pipe suppliers prefer network expansion, while chemicals suppliers prefer quality improvement. Similarly, members of the construction unions will prefer new connections, while those operating the treatment plant that might be expanded will prefer the water quality objective. Prices to industrial versus residential customers illustrate another interest conflict. Of course, if the industrial demander has access to alternative water sources (through its own wells), then the cross-subsidy may not be sustainable—a higher price will result in a loss of revenue for the utility, perhaps leading to poor maintenance and higher future costs for the remaining customers.

Figure 5. Special Interest Issues and Regulators



3. Targets and Performance in Central America

Each of the four types of conflicts occur in the water sector in Central America. The sector is often characterized by bureaucratic battles, lack of data, ideological differences, and disputes among special interests.[3] It is clear that authority conflicts arise within these countries: a 2007 World Bank report describes lack of coordination among agencies, overlapping responsibilities, weak legal frameworks, lack of agency funding, and low capacity for implementing new rules. Recent reports do not provide much factual data on trends, which opens up the likehihood of conflicts over actual sector performance. Opinions are often strongest when information is weakest. Taken together, the reports indicate activity in terms of meetings, but a lack of tangible information for evaluating trends in water sector performance.

The Public Utility Research Center (PURC) at the University of Florida attempted to fill the data gap for the water sector in a project funded by the Inter-American Development Bank (IADB). Table 1 summarizes the set of service providers by country and their water service coverage for the PURC study. The dataset used in the analysis (covering 2002 to 2005) falls short of including a complete "census" of utilities providing service in the region, but it represents a good start.

[3] The World Bank (2006, 2007) sponsored two recent workshops in Central America. One in San Salvador (2006), focused on information systems in Central America. Such systems are "essential" for gathering and storing data in any business environment. However, the presence of information technology is *necessary but not sufficient* for improved data on water utility performance. Latinosan 2007 yielded another report on Latin America and Caribbean—again focusing on sanitation. That conference report describes the institutional structure in each nation http://www.latinosan2007.net/2007/evento.htm.

Table 1: Service Providers by Country 2005 - Summary

COUNTRY	SERVICE PROVIDER	POP SERVED/TOTAL
Costa Rica	AYA & ESPH	51% & 0.5%
El Salvador	ANDA	94%
Guatemala	EMPAGUA &EMAPET	10% & 0.005%
Honduras	SANAA	20%
Nicaragua	ENACAL	52%
Panama	IDAAN	66%

The lack of widely accessible, published information on utility inputs and outputs suggests a lack of transparency in Central America. Nevertheless, broad national trends can be seen in Table 2. Due to data release constraints, this study will only be able to provide a broad overview of performance. Section 3.1 describes changes occurring during 2002-2005 for a subset of performance indicators.

Table 2. Access to Water and Sanitation in Central America

(Extract from 2006 Millenium Development Goals Assessment Report)

		Access to improved drinking-water sources (percentage)								Access to improved sanitation facilities (percentage)							
		1990			2004			MDG target 2015	Progress towards the MDG target	1990			2004			MDG target 2015	Progress towards the MDG target
	U5MR 2004	Urban	Rural	Total	Urban	Rural	Total			Urban	Rural	Total	Urban	Rural	Total		
LATIN AMERICA/CARIBBEAN																	
Costa Rica	13	100	–	–	100	92	97	98	on track	–	97	–	89	97	92	96	–
El Salvador	28	87	48	67	94	70	84	84	on track	70	33	51	77	39	62	76	on track
Guatemala	45	89	72	79	99	92	95	90	on track	73	47	58	90	82	86	79	on track
Honduras	41	92	79	84	95	81	87	92	on track	77	31	50	87	54	69	75	on track
Nicaragua	38	91	46	70	90	63	79	85	on track	64	24	45	56	34	47	73	not on track
Panama	24	99	79	90	99	79	90	95	–	89	51	71	89	51	73	86	–

Notes:

- Data were not available or were insufficient to estimate trends.

3.1 Performance Indicators: The Millenium Development Goals refer to access to improved drinking water and sanitation facilties: there is no clear link to data on infrastructure network coverage (piped water to homes or connections to sewage systems). Nevertheless, the information in Table 2 indicates real progress in the region between 1990 and 2004. Access to improved drinking water for urban areas in the six nations now exceeds 90%. Urban access to improved sanitation facilities is more of a mixed story, reflecting both high cost and low willingness to pay for such services. Of course, access to improved service is more difficult to document than household coverage, since the latter involves billing and a commercial relationship; furthermore, coverage is just one dimension of performance. Service quality and cost containment are two other elements that matter to citizens.

Typically, the first stage of analyzing sector performance involves calculating core performance indicators commonly used by managers and researchers for evaluating specific company trends. There has been some progress in this area—based on initiatives taken by water regulators in South and Central America. The Asociación de Entes Reguladores de Agua y Saneamiento de las Américas (ADERASA, America's Water and Sanitation Regulatory Bodies Association) has collected more comprehensive data on water utility performance for a larger sample of naitons, but that effort only included four of the six nations considered here.[4] The ADERASA benchmarking group has calculated a set of operational, cost, and quality indicators[5] which can be compared to those indicators obtained for the Central American region. Such comparisons allow analysts to begin evaluating the impacts of public policy and managerial incentives in the region. To maintain consistency, this study uses the same definitions of indicators developed by the ADERASA group. Water service provision can be measured by (at least) three factors: volume of water, number of connections, and population served. Below we return to the sample described in Table 1, summarizing performance indicators related to operational performance (including coverage), production cost, and service quality.

3.2 Water Loss (commercial efficiency): This performance indicator reflects deficiencies in either operational or commercial practices. The extent of water losses may reflect a cost trade-off between increasing water production and repairing network leaks to keep up with water demand. In other words, to satisfy demand, managers may find it more costly to repair leaks and to control water losses than increase water production. Pipe leaks in the transport segment require costly maintenance outlays, particularly on long or dispersed networks. Operational water losses arise in transit and are calculated as volume of water produced less water delivered to the distribution network.[6]

Referring to the distribution system, water losses may be either due to water theft or to leakage. Given the characteristics of this sector, it may be difficult for firms to control commercial losses if that entails denying the service to the poorest segments of the population. The potential conflicts associated with this indicator include factual, interest, and values differences.

[4] Founded in 2001, the regulatory association has been instrumental in promoting data collection and data sharing in the region, although it only included three of the six countries under consideration here.
[5] Benchmarking de empresas de agua y saneamiento de Latinoamérica (Anos 2003-2004, 2005).: ADERASA Benchmarking report 2005-2006.
[6] Water is lost during treatment as material is flushed out (perhaps 5-10%); however, the starting point distinction between water produced after treatment or water taken by the plant is not considered here.

Distinguishing theft from leakage is possible but not easy: dealing with theft would require outlays to target geographic areas with excessive losses. Furthermore, those families hooking into municipal distribution systems illegally represent potentially important segments of the voter population. Their interests are recognized by those in power. Values are relevant as well: Finally, there may not be a community support system that places a stigma on such activities. Absence of community values supporting financial sustainability and a view of water as a "human right" make it difficult for utilities to reduce water losses.

For the distribution network, water losses are measured as the difference between water delivered to its starting point (initial treatment) and water billed: the difference identified as commercial losses. Another way of viewing this indicator is to calculate the ratio of water billed to water delivered to the distribution network which is referred by the ADERASA benchmarking group as an indicator for commercial efficiency. Utilities in the Central American sample have water losses of 55% compared with the 40% value found for the ADERASA sample, which includes larger South American countries.[7]

3.3 Metering: This indicator is calculated as the ratio of the number of connections with a meter in place to number of total connections. Meter installation costs are high. In some countries, there is a direct allocation of metering costs to the consumer, which may translate into higher connection fees or tariffs. The higher is the level of metering, the higher the possibility of identifying water losses from the distribution system, and the more accurate will be revenue and collection information. Overall, the median value for metering in the Central American sample is 56%, which is lower than the 75% median value for ADERASA members—a broader sample. Facts are not in dispute, except the extent to which metering might provide better price signals to consumers. Who should bear the costs of metering is an interest conflict. On the values side, some view metering as fundamentally unfair—turning water from a public service that meets basic human needs into a commodity that is only available to those who can afford water.

3.4 Service coverage: This operational performance indicator is calculated as the ratio of population with water service to total population in the area. The median value for water service coverage for the sample of utilities in this region is 90% which is very close to the ADERASA value of 89%. There is a noticeable coverage gap between large and medium-small utilities in the Central American sample. Coverage is equal to 92% for large firms, 66% for medium-sized firms, and 85% for the small utilities group. This indicator captures an important value for citizens as it symbolizes access to piped water. Per capita income is a major role in coverage. However, national objectives established by (and funded by) governments also matter, as does the effectiveness of the system of regulatory and managerial governance. Authority conflicts can damage sector performance; however, if responsibilities are not assigned (or are disputed), there are negative impacts as well. Lack of continuous collection of data severely limits the ability of political leaders and citizens to evaluate trends over time and relative performance across different utilities or divisions of a national utility. Decentralization in several Central American nations has delayed or disrupted data collection efforts on service coverage and other performance variables, so the factual basis for policy development and implementation is

[7] Three groups of utilities are identified for the Central American countries: *large utilities* (IDAAN, AYA, ANDA and ENACAL), *medium-sized utilities* (EMPAGUA and SANAA), and the *small utilities* group (which includes ESPH, Aguas de Puerto Cortes (APC), and EMAPET).

limited. Clearly, national priorities and funding sources affect the pace and pattern of network expansion.

3.5 Network Density: Water companies with a similar scale, measured by number of connected properties, may have different costs due to differences in network characteristics, such as length. Larger firms could have lower costs due to a higher network density (customers per kilometer of pipe) rather than a scale economy (total output). Thus, when conducting benchmarking comparisons, economies of scale and economies of network density need to be distinguished. Here, data collection refers to both utility operating conditions and to statistical information on housing density and family size. Without a national tradition of census procedures and analyses, linking infrastructure activities to geographic and demographic characteristics becomes problematic. Capacity building in government agencies presents a challenge if civil service pay scales are below those in private industry or if political patronage determines employment.

3.6 Water Consumption: The ADERASA benchmarking group utilizes the ratio of volume of water billed to population with water service as an indicator for water consumption. The median consumption value for the Central American sample equals 219 liters per person per day, which is slightly higher than the ADERASA value of 172. Smaller companies are able to satisfy a higher consumption level: 323 liters per person per day, as opposed 222 for larger firms. In and of itself, this indicator carries little policy implications. For water scarce regions, conservation programs could be called for if water consumption seemed inordinately high.

3.7 Number of Workers Per One Thousand Connections: This indicator is used in the water sector literature as signaling labor efficiencies or inefficiencies. A large value suggests the company is using a higher than efficient number of workers on its production process. The median value for this indicator equals 6.6, which is twice the value for ADERASA members, suggesting labor inefficiencies (or lack of scale economies). It is important to note that number of workers considered for this indicator is a total figure which includes contracting or outsourcing labor for some of the utilities. Of course, such a ratio is a partial indicator that ignores other inputs, production characteristics, and output quality. Thus, comparisons based on individual indices are fraught with difficulty. Nevertheless, these numbers and ratios can serve as a starting point for more comprehensive analyses. In the case of workers per connection, the high numbers suggest that managers may have objectives other than production efficiency. However, the next indicator suggests that production costs are relatively low (not controlling for continuity, customer service, and other dimensions of quality).

3.8 Cost Indicators: Operating costs include labor and energy costs, chemicals, and administrative and sales expenses. Depreciation and finance expenses are considered as part of total costs. On average, operating costs are $91/connection. Higher values of network density are associated with lower values for operating costs per connection as would be expected. The median operating cost per cubic meter is $0.10, half the cost of ADERASA member countries. However, medium-sized firms present an average cost of $0.25/$m^3$, although this is still lower than the maximum value for ADERASA members ($0.52 /$m^3$). For the larger utilities, the median administrative expense per connection is $27, whereas it is $34 for the small utilities. Both values are lower than the similar indicator for ADERASA members ($47).

3.9 Quality Indicators: Compliance with water quality standards is somewhat problemmatic, since utilities may not have strong auditing procedures. World Health Organization standards provide one benchmark for water. Alternatively, percent chlorinated serves as an indicator of quality, as does water pressure. Continuity—the number of hours with water service—ranges from 20 to 24 hours in the sample.[8] Number of complaints per connection (median value) is similar for both ADERASA and Central American utilities.[9] The median number of leaks per km of pipe is 2.53 for ADERASA members, almost half the value found in Central American countries, 5.19. This suggests a lower degree of pipe service maintenance for Central American water networks compared with the ADERASA set of water networks. The aggregate national statistics presented in Table 2 do not allow the types of multidimensional performance comparisons that would help policy-makers gauge the effectivess of programs in a nation. High coverage with a low quality of service might have far less benefit than a lower coverage with high "quality" service (reflecting 24-hour continuity, 100% chlorinated, and few complaints).

This brief overview of core (partial) performance indicators for the utilities in the region illustrates the complexity of making comparisons across firms for benchmarking purposes. Unique circumstances affect opportunities for cost containment. Corton (2008) calculates the productivity of each firm using Total Factor Productivity indices for the period 2002-2005. This approach considers the mix of inputs used to produce the selected mix of outputs, providing a more comprehensive performance assessment compared with partial performance indicators (such as output per worker). Identifying trends can give some insights into relative performance where group (or pairwise) comparisons for a single year only provide a snapshot of performance—a blurry one at that.

4. Lessons from Central America

Many factors affect these indicators, including population density, ability to pay (income levels), topography, and distance from bulk water sources. In addition, most performance indicators fail to account for the relationships among factors. A firm that performs well on one measure may do poorly on another, while one company doing reasonably well on all measures may not be viewed as the "most efficient" company. A utility with a low "price" (or operating costs) may be foisting costs onto future customers (as current maintenance is deferred). Or water sources (including storage facilities) may not be developed, leaving future customers to face reduced continuity and dramatic increases in investment requirements.

4.1 Previous Studies of the Americas: Despite progress in the region that has been documented, there is no evidence that utilities are highly efficient ("on the production frontier") or that other important dimensions of sector performance have shown significant improvement. Publication of data enables citizens to gauge the performance of their water utilities—whether these are

[8] ANDA has not reported this indicator.

[9] Complaints can have some peculiar characteristics: complaints may rise after management improves operational procedures if the phone is actually answered by someone! In the current Peruvian (SUNASS) benchmarking scheme, six indicators (compliance with the residual chlorine rule, continuity of service, percentage of water receiving chemical treatment, water coverage, sewerage coverage, and operating efficiency) are related to service quality, coverage, and distance from the frontier. Since SUNASS assigns an equal weight to its nine indicators in determining an overall ranking, it places heavy weight on these service attributes.

state-owned or privately owned. Because of the publication of key input and output data by agencies in Brazil and Peru, a number of researchers have conducted cost and/or production function studies of utilities for these nations, demonstrating the feasibility of making comparisons across firms and over time. Peru has benefited from a series of empirical studies.[10] SUNASS, Peru's water utility regulator, collects data from 46 municipally owned utilities, evaluates their business plans, and provides performance evaluations. The rankings enable citizens and political leaders to gauge progress by utilities.

Data availability has also led to a series of studies on Brazil. Beginning in 1995, the National System of Sanitation Information (SNIS) of Brazil began collecting data; although the system was voluntary, governmental pressure has resulted in the creation of a major database that has permitted scholarly studies of the determinants of costs.[11] Again, a culture of open access to data provides opportunities for independent analyses and promotes the improvement of data collection procedures over time.

The data sets for Brazil and Peru contrast with the lack of consistent data for Central American water and sewerage utilities. The PURC/IADB project was able to obtain data for utilities providing about half the output in the region, representing a foundation for future work. Of course, comparisons using these data may be premature. To be useful for decision-makers, results need to be robust to methodology, model specification, and data outliers.

4.2 Consequences of Inadequate Information and Institutions: Data collection and reporting might be the single most important step towards improving water sector performance. Of course, if utilities refuse to provide information, national governments could shine the spotlight of shame onto the uncooperative entities. However, utilities in national capitals are politically powerful, and may be able to block such initiatives via legislative or executive activities. Some nations (such as Chile) have chosen to use model (hypothetical) firms based on engineering data to identify "best practice." The complex engineering optimization models are then used to set targets for utilities, based on how far the particular utility is from the frontier (as established by the model). This approach has its own problems. Furthermore, substantial financial and operating data are required to validate model coefficients.

In the case of Central America, the lack of data limits the ability of citizens to compare "their" utilities with those in neighboring municipalities or nations. They cannot put pressure on local managers to improve performance since no realistic benchmark can be established. The lack of information also affects opportunities for other types of political and financial change. Without solid information on trends and current performance, political entrepreneurs who might seek to elevate water issues on the national agenda have little basis for launching campaigns. This may

[10] Corton (2003) estimated a cost function to evaluate the efficiency of Peruvian water utilities; Lin (2005) examined the implication of water quality for utility performance rankings in Peru, finding that quality affected measures of relative performance; Berg and Lin (2008) tested the consistency of rankings across different methodologies. Their study examined the consistency of the performance rankings based on two alternative methodologies, each of which has its own strengths and limitations.

[11] For example, Tupper and Resende (2004) used data envelopment analysis to develop efficiency scores for 20 Brazilian water utilities during 1996–2000. Seroa da Motta and Moreira (2006) examined efficiency and regulation in the sector. To gauge the relative efficiency of different ownership and governance systems in Brazil, Sabbioni (2008) used a fixed effects analysis with an unbalanced panel of 180 utilities from 2000 and 340 from 2004.

not be a big problem since water reform champions may not have high survival rates due to the long time horizons (and significant resources) required for developing, investing in, and benefiting from major water investments. Environmental stewardship is costly; for developing countries, the political (and possibly, the economic) pay-offs to alternative investments may be more immediate in transportation, health, and education.

5. Benchmarking and Conflict Resolution

The impacts of organizational conflicts on sector performance are not easy to document. This study points to the limited factual basis for evaluating trends in the various indicators. If political leaders are comfortable with the "low level equilibrium" that characterizes some of the utilities in the region, then pressure to collect data and document performance may not be high: in a world without facts, opinions suffice. On the other hand, multilateral organizations and donor nations are placing greater emphasis on benchmarking to identify productive utilities that would utilize external funds wisely. The World Bank's support for IBNet (http://www.ib-net.org/) and for ADERASA and the Inter-American Development Bank's support for this investigation both demonstrate a commitment to data collection and capacity building in this field.

The other potential areas for disputes, interest conflicts, values conflicts and authority conflicts, all have played roles in the evolution of water policy in the region. Particular interests seek benefits, where costs are borne by others. More funds for urban water systems means less funds are available for rural systems. Expansion of network connections reduces funds available for improvements in water quality. Low prices for current customers denies state-owned utilities funds for service improvements and network expansions. The different groups supporting one or another set of priorities are likely to perceive national funding as a zero sum game. However, when performance improvements can be documented and cost-effectiveness demonstrated, the entire sector can benefit—as water policy-makers and managers gain credibility with those supplying funds.

Values conflicts arise in concerns over ownership and other attitudes towards the water sector. It is likely that utilities in the region will remain state-owned for the near future, despite the problems of obtaining investment funds from development banks or the finance ministry. The politics of ownership seem to support the status quo: a low level equilibrium. In some cities, management contracts have served as mechanisms for introducing change. Other forms of private participation are feasible. For example, investment funds could come from the issuance of bonds—which represents a promising source of capital. However, no private investor will view a water utility as an attractive investment without an up-to-date asset registry, audited income statements and balance sheets, and years of data on operating performance. Currently, those requirements are absent in most of Central America. So the best source of external funds is closed unless, and until, nations mandate the collection and publication of financial and operating statistics.

Citizen awareness, coupled with effective water reform champions, can change attitudes towards nonpayment of bills, water theft, and other dimensions of utility performance. What was once acceptable, or viewed as inevitable, becomes unacceptable if citizens start holding water utilities and government agencies accountable for performance. Such attitudinal changes are partly

dependent on access to information that enables groups to make informed comparisons of utilities.

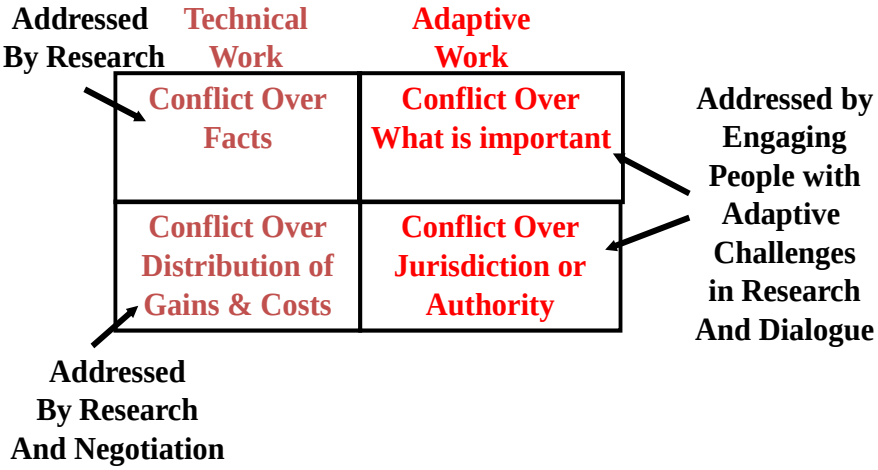
Finally, interagency coordination remains as an important goal in the region. We might expect conflicts in the future as costs of meeting water quality standards. For example, beyond financial sustainability, policy-makers need to consider environmental impacts of all water users. Thus, sanitation coverage warrants attention, as do others who discharge into ecosystems. Local hydrology becomes an element that most water utility benchmarking studies ignore. In addition, sector performance also needs to take into account water resource management. Who is collecting data regarding water supply and water resource quality? If utility managers (and regulators) are not interacting with those responsible for allocating rights to water sources, then the system is likely to be suboptimal over the long term.

We know from the cross-country work of Saleth and Dinar (2004) that institutional changes in the water sector can improve performance, but that integrated water resource management is not simple to implement, nor do operating efficiencies automatically arise. Authority conflicts abound. Efficiency improvements can create win-win possibilities (moving utilities closer to the quality/connections frontier), but these require restructured incentives and changes in operations that are bound to hurt those who benefit from the status quo: the low level equilibrium will not be displaced without major changes in the way water and sanitation services are delivered and financed. Clearly, the policy framework is crucial if benchmarking is to contribute to a reduction in information asymmetries (Burns et al., 2007).

5.1 Strategies for Conflict Resolution: We began by identifying four potential sources of conflict in the design and implementation of water policies: authority conflicts (reflecting jurisdictional disputes over who has the last word), cognitive conflicts (based on technical disagreements regarding the analysis and interpretation of performance data), values conflicts (involving ideological differences or differential preferences for sector outcomes), and interest conflicts (where different groups—utilities, customers, unserved citizens, regions, and unions—benefit or lose, depending on the decision). One can argue that resolving the four conflicts involves two types of work: technical and adaptive.

Figure 6 indicates how the four types conflict are addressed by different types of activities.

Figure 6. Conflict Resolution Matrix



From Mark Jamison

Based on the work to date, the following points underscore how better information can play a role in promoting improved infrastructure performance:

5.2 Research: What are the Facts? Data collection is essential if one is to document relative utility performance, reward those who are on the frontier, and identify those who are far inside the efficiency frontier. Investors focus on the likelihood that funds will be used productively, providing returns to capital. 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 to water utilities in Central America. Furthermore, national development banks have other uses for funds as well—in education, hospitals, and roads. Without evidence of good performance in the water sector, other claims on scarce government resources are likely to be more compelling.

1. *Public Information:* Making information available (public) improves performance. Customers' awareness of baselines and trends improves their understanding of what is feasible and can put citizen pressure on utility regulators and managers. Service delayed is service denied.

2. *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 which provides a baseline for future developments.

3. *Performance Benchmarking:* Benchmarking is part of tariff review; it can be used as a yardstick for comparing the performance of similar utilities. In addition, it helps potential investors and donors analyze the sustainability of service providers.

4. *Data Timeliness and Accuracy:* Data quality is central to any benchmarking process: decision-makers need to be included in the process to promote both accountability and sound business practices.

5.3 Research and Negotiation: How Should Benefits and Costs Be Allocated? Even though stakeholders have different interests, all segments of society share a concern for the sustainability of the sector over time.

5. *Data Definitions and Business Plans:* Information helps both the operator and the regulator – working as a team is recommended: this process need not be adversarial. Clear definitions and a logical structure for data collection and verification are key factors for successful programs. Transparency is fundamental for achieving citizen confidence in the system.

6. *Performance Improvements:* The water sector presents win-win possibilities for various stakeholders. As better information becomes a by-product of operations, the process leads to improved performance. Analysis of performance indicators helps managers save resources by identifying possible problems in the production process: efforts can be directed in a more focused manner.

7. *Evaluating Utilities:* Benchmarking water sectors at a country level yields rankings that provide policy-makers with a factual basis for analyzing and evaluating service providers' performance. Benchmarking needs to become more comprehensive; it should cover social information as well as firm financial and operational data. Social information goes beyond production processes to include coverage, access for the poor, water resource sustainability, and related issues.

5.4 Adaptive Work: What Is Important? (Values) People in government ministries, utilities, regulatory agencies, NGOs, and with other affiliations place different emphasis on the pace and pattern of water network expansion and improved quality of service; however, there is no doubt that it is important to maintain dialogues within nations so stakeholders can understand the concerns of one another.

8. *Establishing Priorities:* Identification and prioritization of goals in a benchmarking process is crucial: if improvements in sector performance cannot be documented, the system loses legitimacy in the eyes of citizens. Furthermore, targets need to be realistic and specific, so decision-makers can be held accountable for sector performance.

9. *Believing Is Seeing:* Our preconceptions shape (and even determine) our perceptions. Getting fundamental values out in the open can help stakeholders see areas for collaboration and consensus. Being grounded in the reality of business plans, best practice, and financial constraints can help stakeholders understand what must be given up to achieve particular objectives.

10. *Cumulative Improvements:* Benchmarking is a valuable tool for the operator; it is an incremental process involving steps that strengthen organizational capabilities. Once basic

information has been processed, the experience yields improvements in procedures as managers better understand information flows and performance outcomes in segments of the utility. Clear and timely information can help managers identify emerging problems—reducing the costs associated with delayed responses.

11. *Urban/Rural Initiatives:* For managers, urban systems have the cost advantages of density; for elected officals, large cities have political clout, as public protests are easier to organize. Small towns and rural areas are often neglected. Benchmarking should include rural areas to bring awareness to policy-makers regarding resource allocation within the sector.

5.5 Adaptive Work: Who Has Jurisdiction? Currently, the jurisdictional overlaps and gaps are significant in the region. Capacity to collect and analyze data is weak. Participants in the PURC Workshop recognize that authority conflicts distract agencies and managers from doing their jobs: harming sector performance.

12. *Data Frameworks:* Companies need comprehensive information systems in order to improve data quality and provide timely information. Such systems need not involve highly advanced information technologies that integrate Geographical Information Systems with real-time measurement of system pressure and consumption. Rather, careful reporting of basic data to a centralized data library provides a good starting point.

13. *Information Is Power:* Those currently controlling access to information must be convinced of the benefits of a centralized database that helps avoid duplication. A changed organizational culture is as important as developing technical capabilities. The latter can be accomplished via training programs; however, these are necessary, but not sufficient, for performance improvements.

14. *Benchmarking Is a Developing Field:* The starting point is having clear definitions. In addition, political leaders, managers, and other stakeholders must commit themselves to maintaining and enhancing the data collection/verification process. The jurisdictional responsibilities must be clear, or little progress will be obtained.

An important use of benchmarking comparisons involves linking managerial incentives more directly to performance. This step is important for state-owned enterprises, since incentives are central to improved performance. Some scholars (e.g., Shuttleworth, 2005; Cubbin, 2005) are skeptical of applying efficiency scores due to the sensitivity of results to model specification, sample size, and outliers. However, caution does not preclude the thoughtful application of appropriate models. The types of models described here serve as catalysts for (1) collecting data to mitigate information asymmetries, (2) identifying sector trends and performance outliers, and (3) designing incentive-based managerial compensation plans. It is likely that far more waste has occurred due to poor management practices (and weak incentives) in developing countries than to the misapplication of infrastructure benchmarking techniques. Nevertheless, benchmarking is no panacea: some groups like the status quo. Information contributes towards the identification of those benefiting from the “low level equilibrium.” Those beneficiaries fight change.

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