Conflict Resolution: Benchmarking Water Utility Performance

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Abstract: *The water sector has economic and symbolic importance for citizens in developing countries. Water utility benchmarking is no panacea for improving water sector performance. Nevertheless, it can contribute to addressing four sources of conflict in the design and implementation of policies: cognitive conflicts (based on technical disagreements regarding how data might be analyzed and interpreted), interest conflicts (where suppliers and demanders obtain different benefits and costs under alternative policies), values conflicts (involving ideology or personal preferences regarding water sector outcomes), and authority conflicts (stemming from jurisdictional disagreements over who has the last word). These potential sources of conflict characterize most politically-charged situations, including water supply management. This paper examines the extent to which water utility benchmarking facilitates conflict resolution. Without information on historical trends, current baselines, and realistic targets, conflicts over reforms to improve sector performance can weaken systems that are already fragile, particularly those in developing countries. This paper attempts to improve our understanding of the links between sources of conflict, government approaches for dealing with conflict, and the role of water utility benchmarking as a complementary strategy for addressing policy issues. Benchmarking is one way regulators and managers can promote conflict resolution that allows participants to focus on performance. The principles apply to all sectors with significant state oversight.*

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Public policy in the area of water supply stirs conflict, including debates over the sustainability of current consumption patterns, fights between agricultural and urban interests, arguments between those seeking growth and those concerned with environmental impacts, and disputes among government agencies over jurisdictional responsibilities. When hostile sovereign states frame the conflict as involving zero-sum resource allocation outcomes, the stakes are particularly high. For example, M. El-Fadel and K. El-Fadl (2005) provide an excellent overview of the "economic, social, cultural, environmental and political issues" in the Middle East. Ideally, those concerned with resolving such conflicts will channel their energies into collaborative activity that stimulates data collection, promotes best practice (for irrigation and water utilities), facilitates mutual awareness (and shared values), and generates a commitment to cooperation. Thus, achieving improved water sector performance will depend on (1) sound science that supports water resource policies, (2) acceptance of proposed water allocation procedures and investment schemes as being beneficial, (3) agreement on the ethical values associated with outcomes, and (4) consensus regarding the division of responsibilities among government agencies—ensuring continued good performance.

When we understand the sources of conflict in water supply we are in a better position to create strategies for addressing complex political issues. This paper focuses on four sources of conflict in policy development and implementation: *cognitive conflicts* (based on technical disagreements regarding how information might be interpreted), *interest conflicts* (where stakeholders obtain different benefits and costs under alternative policies), *values conflicts* (involving ideology or personal preferences regarding outcomes), and *authority conflicts* (stemming from jurisdictional disagreements). These potential sources of conflict characterize most politically-charged situations, with water supply management illustrating the interplay of these forces. Thus, this paper considers some of the organizational forms identified by Sansom (2006) in his analysis of non-state providers of water services; however, the focus here is on water and sanitation utilities, since benchmarking is most extensive in this area.

First, the paper briefly surveys water utility benchmarking initiatives in Latin America, Africa, and Asia. International organizations provided seed money for these data collection initiatives because the impacts their programs cannot be estimated in the absence of baselines. Furthermore, without information on water utility inputs and outputs, it is impossible to determine whether a utility's performance is strong or weak relative to a comparison group. After exploring the sources of conflict in more detail, the paper examines how benchmarking studies can narrow the range for debate. Of course performance comparisons are constrained by data limitations, since these determine which methodologies can be used for analyzing efficiency and the financial sustainability of suppliers. Nevertheless, rough approximations can focus attention on areas requiring further study.

The analysis concludes with Thacher and Rein's (2004) catalogue of alternative government strategies for addressing one of the four types of quarrels: values conflicts. They surveyed four approaches taken by governments: *cost-benefit analysis* (balancing competing goals using monetary metrics), *cycling* between different objectives,

compartmentalization (making different agencies responsible for meeting specific goals), and *case by case decisions* (relying on precedents). These approaches characterize government responses to the other three sources of conflict as well. This paper attempts to improve our understanding of the links between sources of conflict, government approaches for dealing with conflict, and the role of benchmarking as a complementary strategy for addressing infrastructure policy issues.[2]

Benchmarking Activities

Water policies tend to address four broad areas: operations of water/wastewater utilities and other water users, water resource supply, environmental impacts of water use, and the scientific basis for evaluating health and ecological consequences. Performance comparisons could be made in all of these areas, but the focus here is on water/sewerage system (WSS) operations, investments, and outputs. Within the water sector, evaluating efficiency and productivity trends is essential for good management and oversight. Metric benchmarking quantifies the relative performance of organizations or divisions, controlling for external conditions. Using well-established empirical procedures, the analyst can measure performance and identify performance gaps. Rankings can inform policymakers, those providing investment funds (multilateral organizations and private investors), and customers regarding the cost effectiveness of different water utilities. Other benchmarking methodologies include ranking a utility's performance relative to a model company (engineering approach), process benchmarking (involving detailed analysis of operating characteristics), and customer survey benchmarking (identifying customer perceptions). Each approach can play a role in quantifying performance and identifying areas for improvement.

The benchmarking approaches can be key tools for improving service quality, expanding networks, and optimizing operations. Although both regulators and managers are aware of benchmarking techniques, they sometimes lack the professional staff able to conduct analyses. Ideally, the water sector regulator reviews studies and creates performance incentives to achieve policy objectives. 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, in some cases regulators 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*.

Policymakers from the legislative and executive branches of government are also important consumers of information. National policymakers (elected representatives and appointed officials) react to and utilize technical studies in setting priorities and interacting with international organizations. To some extent, the absence of benchmarking information takes pressures off policymakers because citizens are unaware of performance trends and the degree to which utilities fall short of best practice. Since public investments in water

[2] The paper does not address the difficult issues associated with negotiation strategies for high-stakes water conflicts. Snyder (2006) outlines ten practical guidelines for organizing and managing water negotiations.

systems mean less funding is available for hospitals, schools, and other social infrastructure, we want to be sure that water utilities are performing well. Otherwise, policymakers can posture, utilities can continue to provide poor water quality to limited numbers, and consumers can pretend to pay for service (since revenues often do not even cover operating expenses). The outcome damages all three groups. Without information there is no catalyst for reform.

Pressure for information collection has come from a number of directions. In some cases, the initiative is internal. In Brazil, the National Secretary for Environmental Sanitation (SNSA) started a Modernization of the Sanitation Sector Program in 1995. The program included the creation of a National Sanitation Information System (SNIS); http://www.snis.gov.br/oque_snis.htm). The data base consists of data from 382 service companies, covering 4,187 municipal locations (out of 5,561) and 94.3% of urban national population (out of 142 million Brazilian inhabitants). Policy-makers today have the benefit of systematic data collected over an extensive time period.[3]

Other initiatives have had some external support. Multilateral organizations provided seed money for three transnational benchmarking groups: South East Asia Water Utility Network (SEAWUN), Africa's Water Utilities Partnership (WUP) and ADERASA (Asociación de Entes Reguladores de Agua y Saneamiento de las Américas or Association of Water and Sanitation Regulatory Entities of the Americas). The first two are networks of water utilities, and the third is a network of utility regulators. All participate in the World Bank's International Benchmarking Network for Water and Sanitation Utilities (IBNET, http://www.ib-net.org), a collaborative effort with four objectives: (1) to define and develop indicators and data collection methods, (2) to promote national and regional initiatives; (3) to make performance comparisons among comparable firms; and (4) creating links between water utilities. Another organization of water professionals supporting benchmarking initiatives is the International Water Association, which has published manuals of performance indicators for water (Alegre et. al. 2000.) and wastewater (Matos et. al. 2003).

The first major regional utility-oriented benchmarking program was begun in 2000: Water Utility Partnership (WUP) for Capacity Building in Africa, SPBNET. (www.wupafrica.org). The database on this web site includes 110 African water utilities and was developed with the financial and technical support of the United Kingdom's Department of International Development (DFID). The data were collected primarily from results of a questionnaire survey and relate mainly to the year 2000. Within this database, nine private water utilities across eight African countries contributed data, but incomplete data entries for some of the utilities placed limitations on what could be used for a comprehensive analysis of performance and cost effectiveness across African water utilities.[4]

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[3] Studies based on these data have been prepared by Tupper and Resende (2004) and Sabbioni (2005). Berg et. al. (2006) identified over fifty published water utility efficiency studies.

[4] Estache, A. and E. Kouassi (2002) use data from a sample of 21 water utilities for 1995-1997 to evaluate the relative efficiency of African water utilities. The results indicate substantial heterogeneity in African water utilities' performance and suggest that institutional factors such as low level of corruption, high

ADERASA was formed in 2001 by representatives of 10 Latin American regulatory entities and observers for two other nations (www.aderasa.org). Support from the World Bank provided some seed money for the initiative. ADERASA's objective is to promote cooperation to improve water sector performance in Latin America. Subsequent meetings have facilitated the exchange of experiences and formation of task forces on tariffs, customers, and benchmarking. By 2005, data were available on 54 service companies. Countries are encouraged to provide 133 variables for each service company in order to calculate 58 Performance Indicators.

Another utility-based network, SEAWUN, was established in 2002 with funding from the Asian Development Bank (http://www.seawun.org/benchmarking) The organization uses an Overall Performance Indicator (OPI) that combines a number of partial indicators (like labor productivity and water quality indices) to develop scores for an Overall Ranking among 47 participating water utilities (representing about 2% of the estimated total water utilities in South East Asia).[5] SEAWUN has published rankings and identified the strongest and weakest performers in the group.

The above examples illustrate how regulators and operators have responded to their legal oversight obligations and to pressures from political actors and multilateral organizations for better documentation regarding water utility performance. Having a comprehensive factual basis for policy development, implementation, and evaluation is a key requirement of successful reform initiatives. Such information can diffuse one source of conflict: disagreements over "what is" (facts) and "what is possible" (feasible targets, given resource constraints).

Sources of Conflict

A quarter of a century ago, Bill Lord (1979) outlined sources of conflict in the water resources planning arena: cognitive, interest, and value conflicts. To these three, Leonard Shabman (2005) has added authority conflicts—where the political jurisdiction suitable for developing and implementing policy is not established or authority is unclear. Take these in order.

"Cognitive" conflicts are disputes over factual matters: "What is?" Examples include impacts of rate design, the incidence of benefits in subsidy programs, and relative utility performance. What happens to water consumption per household under a particular conservation program? What customer groups actually benefit from inverted rate designs? Which firms are most efficient (and why)? Technical disagreements reflect

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quality of governance, and privatization have positive impacts in improving efficiency. Also, see Kirkpatrick, Parker, and Zhang (2004).

[5] Estache, A. and M. Rossi (2002) use 1995 data from a sample of 50 water companies in 29 Asian and Pacific region countries; they find that efficiency is not significantly different between private and public utilities.

cognitive conflicts. Such conflicts can be reduced through comprehensive data collection and analysis. Investment in the production of new scientific knowledge improves the scientific basis for policy by providing a better understanding of physical and behavioral relationships required for modeling water systems and for developing water policy.

"Interest" conflicts reflect the differential impacts of policies on various stakeholder groups: "For whom is the policy?" If the situation is actually a zero-sum game, one group benefits at another's expense. If there is no compensation for lost economic (or social) values due to the policy under consideration, those harmed will fight the policy. For example, granting a consumption use permit to a set of agricultural interests can mean that a municipal water utility is forced to go to higher cost sources—such as a long pipeline or desalinization. The political economy of regulation suggests that when the beneficiaries of a particular policy are concentrated (and per capita benefits are high) and the losers are diffuse (and the per capita damages are low), rational investments in political lobbying are likely to result in policies that benefit well-organized stakeholders—even when the costs to the losers outweigh the benefits to the winners. Thus, special interests articulate their views and are able to influence laws and their implementation. Greater transparency, benchmarking comparisons, and citizen participation can generate controversy, but at least the stakes are more clearly identified.

"Values" conflicts are more ideological in nature, reflecting the different preferences or values of groups. Here, there may not be a political consensus over the weight assigned to particular outcomes, especially outcomes involving non-monetary impacts. Thus, the choice between environmental quality and economic growth can depend on one's income and personal values. Improved technical understanding of the implications of alternative water policies need not resolve "interest" or "values" conflicts. Both involve "What should be?" rather than "What is?" or "What are the consequences?" Thacher and Rein (2004) focused on this type of conflict, although their insights apply to the other sources of disagreement as well.

"Authority" conflicts are based on different views regarding where decisions will or ought to be made.[6] When an issue arises, the jurisdiction may not yet be assigned or the issue might be addressed by multiple agencies. When there is lack of clarity, stakeholders will go jurisdiction-shopping—selecting the agency or the level of government most likely to support its interests in policy design and implementation. Appeals procedures within the judicial system can delay implementation. In such situations, benefits delayed are (effectively) benefits denied.

These four conflicts characterize most on-going policy issues. Water policy is particularly sensitive to public opinion because the sector significantly affects citizens.[7]

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[6] Heikkila (2004) combines common-pool resource management theory and local public choice theory in a thoughtful empirical study of jurisdictional issues in California water programs. She shows that jurisdictional collaboration can be facilitated by functionally specialized institutions established to address shared problems. Leach, Pelkey, and Sabatier (2002) describe consensus-seeking water partnerships in California and Washington.

[7] The U.S. Environmental Protection Agency (EPA) estimated in 1997 that water infrastructure in the U.S. (including pipes for drinking water and wastewater collection) needed $138 billion over 20 years. The

In addition, stakeholders (such as agricultural and industrial interests or environmental coalitions) are often politically powerful. The range of concerns means that political coalitions based on regional alliances (interests) or ideological predispositions (values) form around issues. The coalitions support policy initiatives that meet their concerns. For example in the values area, some groups focus on social justice (or fairness), particularly regarding the effect of water prices on low-income citizens. Others place great weight on environmental impacts associated with water usage and seek investments in research and development and conservation to reduce those impacts. In the absence of subsidies, reducing environmental impacts raises the cost and the price of water service.

Shortcomings of Benchmarking as an Instrument in Conflict Resolution

The range of regulatory and managerial conflict can be constrained via performance benchmarking. With transparency, relative performance indicators can be used to create incentives for improved performance. However, benchmarking is no panacea. Studies that are poorly done or misinterpreted can lead to establishing inappropriate targets and poor incentives for water and wastewater (WSS) utilities. Metric benchmarking utilizes quantitative techniques: the results are only as good as the underlying data and models utilized in the analysis. Poor studies end up expanding the range of potential conflict; weak analyses do not promote agreement on the "facts".

Both data and models present problems. Available data may not capture reality, and where the numbers are "correct", key factors affecting costs and output may be omitted from the quantitative analysis. The model's results may be very sensitive to specification. "If you torture the data, they will confess." Thus, if the group conducting the study lacks technical skills, the absence of sound statistical procedures and careful sensitivity tests will yield misleading results.

The idea behind metric benchmarking (using production and cost functions) is well developed on theoretical grounds; furthermore, it has an admirable objective. Nevertheless, in practice, the results can be distorted. There are still many problems with the various methodologies, which supports postponing studies until the data can be fully audited and analysts achieve more agreement regarding which methodologies should be applied in particular circumstances. Some of the potential shortcomings of current practice in performance benchmarking are listed below:

Information Asymmetries: Benchmarking requires significant amounts of data that are often quite difficult to collect. It also depends on the accuracy of the data that are collected. The information collected may be verified by the regulator (or analyst), but this

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American Water Works Association reviewed the water distribution network issues and re-estimated the need to be $360 billion for the period. In 2000, the Water Infrastructure Network published a report estimating nearly $1 trillion in investments would be needed over two decades. Such estimates may be inflating the dollars to justify massive federal programs. However, they suggest the water utility component of the water problem is non-trivial. Add to this number the costs of operating utility systems, promoting greater security, agricultural run-off, wetlands destruction, and related issues, and the water sector presents a set of high profile policy problems.

usually comes at some cost. In additional, some data are unverifiable by the regulator or extremely costly to acquire. From this point of view, the regulator has to trust the firm regarding the truthfulness and accuracy of reported data. We then end up in a situation of severe information asymmetry: the fundamental problem of regulation. Recall that the principle behind benchmarking is that regulators cannot rely solely on the information provided by the firm when designing its regulatory framework (including targets and incentives). Since the utility benefits from having private information, regulators would like to avoid such dependence when designing targets for a rate of return based price structure or a price cap regime (including an X-factor reflecting targeted efficiency improvements). However, if a benchmarking methodology still requires information from the firm, one can argue that we have gained little by choosing this more sophisticated method.

Sensitivity to Model Specification: Quantitative techniques utilized by most benchmarking methodologies produce dramatically different results under similar circumstances. A quick review to the literature on benchmarking reveals that conclusions (such as performance rankings or scores) differ considerably, depending on the variables chosen, on the particular methodology applied, on the interval of time considered, as well as other factors that need to be determined for a benchmarking study. This point applies to all the methodologies used: from simple ratio analyses to sophisticated quantitative techniques (such as ordinary least squares, stochastic frontier analysis (SFA), Data Envelopment Analysis (DEA), and distance functions (Berg, et. al. 2006). This observation raises questions about how reliable a benchmarking process can be, especially when we realize that performance comparisons affect the economic foundations and financial sustainability of a company that is usually the sole provider of WSS service in a particular geographic area. This important issue brings into question the use of complicated mathematical algorithms that are sensitive manipulation.

Unique Situations: Every firm is different. Even when there might be utilities providing the same service-mix in similar areas, seldom are the operating environments the same. There is always a particular input, geographic feature, or specific technological consideration that differs from one firm to the other, raising doubts about the possibility of a fair comparison between the two WSS utilities. Inherited infrastructure is one of these features, since it is rare to see firms starting from zero and building entire networks and facilities as a Greenfield activity. In the case of privatized water and sewerage utilities, the utilities inherited fixed assets already designed and installed years or decades ago. Publicly owned utilities have generally received soft loans or grants in the past, leading to networks that reflected past political priorities.

Single Performance Indicator: Given the multiple dimensions of WSS output and inter-temporal considerations (financial and water resource sustainability), coming up with a single performance index may be impossible. So-called "total methods" (regression analysis) can still yield problematic performance scores. For example one utility could keep costs down by not performing maintenance, but the consequences for costs in the future could be dramatic. Another utility might be engaging in an expansive capacity development program for employees, which will have payoffs in the future, but place the

company in the "high cost" category at present. To capture some service quality elements, customer surveys might be used to supplement production data: citizen evaluations matter. However, we know that "Believing is seeing," which suggests that customer perceptions might be unduly influenced by attitudes (reflecting past performance or some highly publicized event). No ideal index has been developed.

This list of doubts about the applicability of benchmarking techniques could be easily extended. Such concerns are quite important and must be addressed by those conducting (and using) performance comparisons. Perhaps the strongest response to these concerns is the following observation: benchmarking is fundamental requirement of good management. If regulators cannot identify historical trends, determine today's baseline performance, and quantify relative performance across WSS utilities, then (as an Indian regulator has said) those attempting to implement public policy may as well be "writing pretty poetry."

Ultimately, water utility professionals are only able to manage what they can measure, whether that involves water losses, water quality, service coverage, productivity, financial sustainability or customer satisfaction. Benchmarking represents the most important tool for providing citizens and policy-makers with solid information on trends and baselines.

Obtaining Rigor and Relevance Using Benchmarking Techniques

Efficiency evaluation plays an important role in policy development, organizational governance, and the creation of performance incentives. Benchmarking can serve as a tool for resolving factual disputes. First, regulators first need to figure out what they really want to compare. They might want to focus only on cost minimization. In this case, they can choose from among several models: standard regression models, corrected ordinary least squares (COLS), Stochastic Frontier Analysis (SFA) of production (or cost) functions or multiple output Data Envelopment Analysis (DEA). Some of the techniques can be used to evaluate relative movements towards the efficiency frontier and shifts in the frontier. Clearly, the panel data (time series and cross section) and expertise required for such studies may not be available in many government agencies.

Second, regulators should be aware of the advantages and shortages of different models and choose the most appropriate ones to do the benchmarking and evaluation. In the case of Overall Performance Indicators (OPIs) as used by the Peruvian water regulator (SUNASS) and utilities in Southeast Asia (SEAWUN), the components are generally assigned equal weights. This weighting is arbitrary and not convincing. Regression models focus on the cost efficiency of a company, but can fail to consider other important factors such as quality of service, coverage of service, and financial sustainability of current prices. In addition, an inherent problem of regression analysis is that it requires specification of functional form, which risks fitting in an inappropriate function. Furthermore, unsophisticated regression analysis is limited to only one dependent variable, which might not depict the real world in a comprehensive way.

DEA models do not have these limitations. DEA does not require the specification of a functional form to be fitted, nor does it need to impose weights to the factors. DEA allows for multiple outputs and inputs. In addition, DEA analysis can give us more information than the ranking. It can also be used to evaluate the return to scale and can set the goal for inefficient companies regarding how much they should improve to get on the efficient frontier. However, DEA models are not perfect either.

The outcome of a DEA study is sensitive to the selection of the models and different DEA methods. DEA has been developed in a non-statistical framework, so hypothesis testing is problematic In addition, DEA does not account for possible noise. SFA is arguably a better method. It accounts for the effect of the random shocks and statistical noise and can accommodate multiple inputs and outputs by using the distance function. However, it also has potential problems; in particular, the standard SFA method uses a specific assumption on the skewness of residuals to separate inefficiency from measurement errors. All techniques have their advantages and disadvantages.

Third, regulators can select two to three appropriate techniques to construct models, conducting a three-level consistency tests to compare the outcomes of different methods and decide whether the model chosen is needed or not. If it is a panel data, regulators should also check whether these efficiency measures are consistent over time. If the consistency tests are satisfied, the choice of techniques is inconsequential. If the tests are not satisfied, extra emphasis should be put on the companies with coincident ranking and with totally opposite rankings. In these ways, regulators can provide a relatively fair and convincing ranking to inform the public.

Strategies for Managing Conflicts

Recognizing the limitations of benchmarking, we can still consider its role in managing conflicts. Goals can be complementary or conflicting: the latter require that policy choices focus on one objective to the detriment of others. Thacher and Rein (2004) note that the instrumentalist approach (as with cost-benefit analysis) expresses outcomes in terms of a common metric: values are taken to be commensurable, so a single overarching objective function is used for comparing outcomes associated with alternative policies. Economists are generally comfortable with this framework, although incorporating risk into studies requires analysts to characterize that risk and assign a risk premium for evaluating net present values. Whether political leaders are as comfortable with this approach is another question altogether: "When a policy actor encounters a new situation in which its goals conflict, it may find that its preferences are simply unfinished. Existing models of policy rationality have great difficulty in accommodating such situations." (Thacher and Rein, 2004, p. 458)[8]

They go on to describe three other strategies utilized by policy actors for coping with ambiguity: ". . . they cycle between competing values over time; they assign primary

[8] Thacher and Rein (2004) focus on the rationality of alternatives to the instrumentalist framework. The present study uses the water sector to illustrate how the sources of conflict partly determine the policy strategy most likely to meet citizen values over the long run.

responsibility for pursuing each value to a separate institution; or they eschew general decisions about the relative merits of two goals, preferring case-by-case resolutions of particular problems that draw on analogical reasoning and situated judgment" (p. 458). Although these strategies do not require commensurability among values, they can yield valuable information about the impacts of focused policies and citizen attitudes toward outcomes: "In this sense, commensurability at best *results* from the response to value [or other] conflict rather than guiding it." (p. 458)

How does water utility benchmarking contribute to making the four strategies more effective as mechanisms for resolving conflicts? Let us consider each strategy in turn, recognizing that policy decisions are likely to be based on a blend of these approaches.

Cost-Benefit Analysis: Balancing benefits and costs requires quantification, the core feature of metric benchmarking. With its emphasis on efficiency and the creation of net economic benefits, this framework focuses on productivity, best practice, and the promotion of innovation. Technical cost-benefit studies are often used to eliminate strategies that do not warrant further attention from political actors.[9] Its advantages include the ability to incorporate multiple impacts into a single summary statistic. However, when there are conflicts regarding values (the ultimate weights to be given different objectives), political systems are not likely to depend solely on cost-benefit analysis. Efficiency is not going to be acceptable as an ultimate value. In addition, using money as a common denominator violates some ethical principles.[10] Thus, this strategy might be able to eliminate truly "bad" policies, but will not be applied with the outcomes of alternative policy options fall into a reasonable range.

Cycling Between Competing Values: By focusing sequentially on specific values (and associated outcomes), this approach yields policies that improve performance along one dimension at a time. However, this means that in the interim other values are neglected. Once the negative consequences become unacceptable, the other value is given priority. This approach leads to action toward meeting one objective, but yields information about side effects. This approach ". . . may facilitate the invention of new strategies so that they become progressively more sophisticated in the way they handle the dilemma over time." (Thacher and Rein, 2004, p. 463) For example, environmentalists might argue that it is time to give priority to ecological systems because a tough policy would likely result in technological and organizational innovations, allowing other goals to be met. They might argue that the system has become locked into weak performance along this valued dimension of performance. From their perspective, delaying a water policy shift toward meeting environmental objectives might lead to further irreversible damages inflicted by

[9] A colleague who served on the Council of Economic Advisors, when asked what he did during his term of service, replied: "I killed dumb ideas." The use of a cost-benefit analysis can screen out poor policies.

[10] Greer (1993) notes, "Teleological standards are typically concerned with ends that are continuously variable, subject to balancing, and offer opportunities of comparison." (p. 10) He distinguishes between ". . . *teleological standards*, which focus on the non-moral outcomes or results of acts or rules, and *imperative standards*, which hold that certain acts or rules are right or wrong in themselves, regardless of the economic or other consequences." (p. 12) Citizens not only care about both the means and the ends, they also adopt non-teleological or imperative standards, where trade-offs are not acceptable: "Thou shall not kill" illustrates one such moral judgment on human behavior.

residential, commercial, and industrial development. In the interim, the shift in priorities might allow for improving the science of water supply management, providing the data for decision-making and lowering the costs of meeting objectives. Benchmarking can contribute to one phase of this process: highlighting relative efficiency. In his case study of water industry regulation, Maloney (2001) describes such policy cycling as being "episodic" where values conflicts arise in terms of the sequencing priorities. Of course, the resulting flip-flopping on policies can weaken citizen confidence in the political system and introduce greater policy uncertainty into the equation—raising the cost of capital.

Compartmentalization through Specialized Agencies: The need for specialized skills and regular interactions with particular constituencies is one reason for creating agencies that pursue particular values. It simplifies policy design, since multiple objectives would require multiple policy instruments. This strategy ensures that each value will have a strong champion responsible for putting forward specific claims on society: organizational firewalls avoid having to consider multiple values. Although such compartmentalization is likely to create jurisdictional conflict, at least the debate has a chance of becoming public and transparent. When agencies are assigned multiple tasks they are forced to make trade-offs that might generate substantial internal conflict. Thus, we generally find specialization in the in the water sector. Environmental agencies, health agencies, resource management agencies, and utility regulators focus on different objectives: environmental protection, public health, sustainability, and efficiency (and low prices), respectively. Benchmarking is a particularly important tool for utility regulators. Ultimately, agencies are in a position to collaborate to ensure that policies are consistent. Alternatively, agencies might participate in jurisdictional conflicts as they battle one another in the court system or the legislative arena—determining primacy (Nicholson-Crotty, 2005). Maloney (2001) describes how the division of labor among water agencies in England and Wales led to the water utility regulator (OFWAT) fighting the National Rivers Authority (and its successor, Environmental Agency) to delay the implementation of the European Community Urban Wastewater Treatment Directive. The process led to some balancing of the objectives pursued in a single-minded way by each agency. In this case, cost containment and lower prices were given priority, relative to meeting tighter water quality standards.

Case-by-Case Resolution: A fourth approach (labeled *casuistry* by Thacher and Rein) involves political actors avoiding general decisions regarding the weights to be assigned different values. Rather, the approach incorporates arguments based on how the current situation is similar to or different from previous situations that generated specific policy responses. This strategy requires that the agency consider conflicting values simultaneously. Staff reason on the basis of analogies rather than from first principles: "In this respect casuistry resembles contemporary jurisprudence, where the meaning of vague legal provisions like 'due process' and the proper resolution of conflicts among them are worked out case-by-case by drawing analogies with established legal precedents." (Thacher and Rein, 2004, p. 477) This strategy would seem to be a very nuanced (and flexible) approach to problem-solving; rather than striking a balance in terms of abstract principles, facts (and actors) determine the decision regarding specific

policies. Benchmarking studies can be viewed as one input in the case-by-case process: providing baselines, relative comparisons, and trends over time.

Concluding Observations

The conceptual frameworks, quantitative techniques, decision-tools, and strategies for handling conflicts come from a number of disciplines. We observe national and regional organizations attempting to create data bases that serve as the foundation for technical studies. Some studies focus on production processes, engineering models, and customer satisfaction. Here, we have identified empirical techniques that allow analysts to characterize cost and production functions. Economists prepare such studies to rank utilities in terms of performance—providing information for designing incentives and improving public policy. Studies can also gauge the impacts of past policies promulgated within particular jurisdictions or determine whether particular firm characteristics (organizational design or ownership), topological features, density, and other elements affect costs (including scale economies). The field of Political Science helps us identify sources of conflict and principles of conflict resolution. Facts can limit disputes, but there needs to be high confidence in the models and data that yielded those "facts". Finally, the field of Public Administration describes ways political systems deal with ambiguities (through cost-benefit studies, cycling through alternative objectives, compartmentalization of agencies, and case by case decisions).

Any benchmarking study will have limitations, but sound studies can be used to place the burden of proof on other parties who might argue that the analysis is incomplete or incorrect. Over time, data availability will improve and studies will be strengthened as professionals gain experience with these quantitative techniques. In the process, governance procedures within companies can incorporate this information into managerial incentive packages. Thus, rankings can serve as catalysts for better stewardship of water and other resources. Still, care must be taken to use comprehensive indicators, lest those being evaluated "game" the system. If only a subset is used, performance may improve for some dimensions of a firm's operations but may diminish for others.

Quantitative analysis can also be applied to broader sets of water issues, as illustrated by the path-breaking work by Saleth and Dinar (2004). They examine how institutional differences (water policy, water law, and water administration) affect water sector performance. They attempt to capture the linkages among twenty-one institutional variables and performance (four institutional performance variables and one water sector performance variable). In addition, they utilize twelve exogenous variables like development status, demographic conditions, ecological status, and external perceptions of national creditworthiness to control for other factors. Using a sample of thirty-nine nations (and institutional variable values based on surveys of country water experts) they test a number of models linking institutions to performance. Given the issues of data and model specification, suffice it to note that results are highly suggestive, but by no means definitive. However, the study illustrates the role of empirical research in identifying elements important for sequencing and packaging institutional reforms.

In summary, benchmarking represents an important tool for documenting past performance, establishing baselines for gauging improvements, making comparisons across service providers, and identifying reasonable targets. In the water utility sector, valid comparisons can contribute to improved performance by taking away one important area for potential conflict: disagreements regarding "what *is*" and "what *is possible*". Rankings can inform policymakers, the providers of investment funds, and customers regarding the efficiency of different service providers. Ultimately, citizens and policy-makers seek improvements in sector performance. Those improvements can be verified (and quantified) through benchmarking.

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