Measuring Impacts of Community Water System Local Government, Board and Management Training

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Introduction

Community water systems in the United States face some of the most daunting challenges imaginable. While the United States arguably has one of the world's best water supply systems, water infrastructure is straining from needed replacements. As documented in the Penn State University film "Liquid Assets" water pipes are often at least 20 years old (often up to 100 years old) and needing maintenance, if not replacement. (See, http://liquidassets.psu.edu/). This adds up to huge investments that are needed by local, state and federal government to maintain water and wastewater infrastructure. According to EPA (2002:5),

> Estimates of capital needs for clean water from 2000 to 2019 range from $331 billion to $450 billion with a point estimate of $388 billion. Estimates of capital needs for drinking water over the twenty-year period range from $154 billion to $446 billion with a point estimate of $274 billion. […]The [operations and maintenance (O&M)] gap for clean water over the next twenty years is between $72 billion and $229 billion with a point estimate of $148 billion […], and the gap is between $0 billion and $80 billion with a point estimate of $10 billion […]. The drinking water O&M gap is between $0 billion and $495 billion with a point estimate of $161 billion […].

While these are national estimates of the gap between available financing (including water rates, as well as loans and grants from the federal and state government) and the estimated need, the implications are that localities will need to pick up more of the tab for repairing depreciating water infrastructure. These new expenditures come as community water system integrity is threatened by new contaminants, increased regulations, and workforce issues. There have been a flurry of contamination challenges in the last decade, including military-industrial emissions, such as *perchlorate*, agricultural emissions such as *atrazine*, and increased public concern about newly discovered contaminants including pharmaceuticals. The impact of these issues on water systems has been

exacerbated by increased regulations, including lowering the acceptable level of arsenic in water to 10 parts per billion, and the implementation of the "Ground Water Rule" which requires water treatment and sampling in many systems that previously simply delivered water from deep wells to community residents. An additional strain comes in the form of needed workforce replacement, as the baby boomer water operators retire and replacements need to be found. All of these issues are especially vexing as water systems in the United States are highly decentralized. Those Americans who receive potable water through public water systems are served by 54,000 water systems, 85% of which serve less than 3,000 customers.

To address these problems, the 1996 Amendments to the Safe Drinking Water Act (SDWA) called for programs to enhance **water system capacity development**. Capacity development of water systems has been widely interpreted to mean that **community water systems have the technical, managerial and financial (TMF) capabilities to sustainably deliver potable water to community residents and other customers**—indicated by the **ability to meet EPA SDWA regulations**. While the protocols and principles are fairly well established for how to improve technical capacity (through operator training and technical assistance) and financial capacity (through improved bookkeeping and capital planning), managerial capacity has presented a much more difficult challenge. Management decisions are made at multiple levels: by plant supervisors; by water operators; by community water system boards or committees; and by mayors and village or city councils. There are utility management trainings designed for utility employees, such as water operators and water plant supervisors.[1] The problem is that many community officials, especially in small towns, lack the basic knowledge about the details of running a water system. This manual will address training of public officials, which is usually

[1] For an example of such a training institute, see the Kentucky Technical Assistance Center at Western Kentucky University. In partnership with the Kentucky Rural Water Association they deliver the Kentucky Utility Management Institute. (For more information see, http://waterky.org/index.php?q=node/353, Retrieved on September 30, 2009.

done through board and management training (BMT). BMT is designed to improve the decision-making capacity of public officials on water issues as well as to improve basic governance practices.

BMT programs are increasingly prominent in the United States. Since drinking water regulations are implemented by state **primacy agencies**,[2] these trainings vary by state in the context of implementation and design. Depending on the training design, as well as the regulatory, environmental, and socioeconomic context, outcomes of training are likely to differ by states. In times of increasingly tight budgets, state governments are very interested in tracking the outcomes of community water board and management training. This manual will offer the different methods of tracking the impacts of BMT. These methods will be more or less possible depending on the training design.

[2] For more information about the primacy agency system in implement drinking water regulation, see http://www.epa.gov/ogwdw000/sdwa/pdfs/fs_30ann_sdwa_web.pdf, retrieved on September 30, 2009.

Why Board and Management Training

The quality of water system management is, more than anything else, dependent on the quality of the elected officials who make decisions about how their local water systems are managed. Well run water systems can often attribute their success to a good water operator who had the backing of an engaged water board. On the other hand, even the best water operator can find him or herself undermined by a water board more interested in keeping rates low and uninterested in the long term planning necessary for running a water system. There are many horror stories about water boards that really didn't understand what it takes to run a well functioning water system. For small community water systems, the risks of poor management are exacerbated by trends in rural economic development.

New trends in economic development in rural areas are creating challenges for water management. For instance, the increased interest in home-grown, renewable fuels, led to a dramatic increase in ethanol facilities from 2006-2008. Ethanol production is also supported by government programs both at the state and federal level. While these facilities are seen as an economic boon for many communities in the Corn Belt (which stretches across much of the Midwestern United States), an average size ethanol facility can withdraw more than one million gallons of water per day as part of the distilling and production process. Many community water systems in this region are groundwater dependent. This amount of water withdrawal could lead some communities to move from groundwater to blends of surface and groundwater, which would require a higher level of certification for system operators.

There are also new regulatory issues. The most obvious of these is the recently implemented Groundwater Rule. For many of the very smallest and most rural water systems the Groundwater Rule will mean transitioning from a system that basically takes water out of the ground and distributes it to

customers, to a regime of testing and treatment. This, too, will require a higher level of operator training and certification. The implications for a small community in New Mexico, for instance, may well be that the older resident who has operated the system for years is no longer qualified to operate it. The community may well need a new, better trained operator.

The problem is that many of the decision makers at the community level, the community water system board, the mayor, the city councilors, don't understand the implications of these issues. Always diligent about keeping down water rates and minimizing allocation of community financial resources to provision of drinking water, they are loath to allocate the resources to maintain or improve operational capacity. Those of us who work with small system operators hear this complaint continually. This can create a climate of increasing tension at the community level, as operators feel they are underappreciated and denied the opportunity for needed training. Ultimately, this comes down to a question of improving management capacity so that those with fiduciary responsibility of community water systems can understand the constantly changing technical, ecological and regulatory context and the need for ongoing training to maintain operations capacity.

The rationale for BMT is related to efforts to improve the capacity of small water systems, as stated in the 1996 amendments to the SDWA. The efforts at capacity development have been bolstered further by growing concern about the financial viability of the water delivery system in general. Brown (2004) argues that BMT is a major part of the strategy to help small water systems grapple with the reality that, because issues cited in the EPA Infrastructure Gap Analysis of 2002:

> Without measures to increase revenues and reduce costs, in the next several decades, our water and sewer systems will experience serious financial upsets that may shut some systems down and seriously imperil the operations of many others. The effects will hit small rural systems disproportionately hard. (Brown, 2004: 27)

While Brown argues that BMT is most valuable in helping small water system board members to understand financial management, others see the importance of BMT in helping water boards with basic group decision making process--how to run a meeting, solicit input, and come to closure on issues (Knotts 2004). Ricks (2004: 1) argues that BMT is a means of improving a poor,

> [M]anagement structure [to mitigate or eliminate] customer complaints, employee turnover, financial problems, [and] regulatory compliance problems [that] ultimately can spiral out of hand.

A serious issue facing small community water systems is they often lack the resources to hire experienced management staff, thus leaving management decisions to volunteer water boards which often lack management expertise and operators who work at the pleasure of these boards. BMT should provide these volunteers with basic skills for making these critical management decisions, which may range from asset management, to system financial and other planning, to rate structure design and implementation (Kemp-Rye 2004; Ricks 2004).

In short, BMT is deemed necessary because to provide elected or appointed officials who serve as the boards of directors of small community water systems the support and training they need to better manage community water system. According to the EPA, 83 percent of community water systems in the United States serve fewer than 3,300 customers (EPA 2008). These systems have a disproportionately large number of health-based violations and often lack experienced municipal and board members to implement the kinds of policies and procedures to correct these issues over time. BMT may also help with communication both within the community and with exogenous institutions such as government agencies. Lack of communication is seen as one of the critical sources of problems in small water systems (Dziegielewski and Bik 2004).

What are the Different Training Systems

There are several ways that BMT could be implemented. States like Mississippi and Louisiana have laws that mandate that all public officials who are appointed or elected to small community water system governance positions in systems[3] must receive BMT within a year of their appointment.

In many other states, there are no laws that specifically require that public officials be trained. In these states, there must be incentives to entice public officials to attend training. These may be in the form of personal incentives. In Kentucky, commissioners of all water systems that fall under the jurisdiction of the Public Services Commission (PSC), (public water districts, public water associations, and investor owned utilities) must receive BMT training to be eligible for a higher grade of salary (from $3500 to $6000) for their service as commissioners. The incentives are more often in the form of improved ranking for loans or grant applications to fix community problems. In Kansas, attending BMT can improve the credit ranking of a given community system for receiving government loans or grants. In Ohio, water system representatives are strongly encouraged by regulators and agency officials to attend trainings to demonstrate capacity before applying for loans or grants. In Kentucky, key informants report that officials in communities in significant non-compliance with safe drinking water act regulations are strongly encouraged to attend water trainings. For those community water systems in Kentucky that are not regulated by PSC and for communities in states like Illinois, technical assistance providers may suggest that they can come to the a community board meeting and provide training to board members based on specific needs. Again, this may be used as a way of demonstrating community water systems capacity.

[3] In Mississippi, the cutoff was originally for water systems with 2,500 hookups or less. This is the cutoff for systems in Louisiana as well. In Mississippi, there has been an effort in the last year to expand those receiving training – to require BMT for all public officials with systems with less than 10,000 customers. For more information see, http://msucares.com/water/waterboard/waterindex.html, retrieved September 30, 2009.

Depending on the training model, the number of contact hours and the amount of information provided may vary considerably. In the Mississippi model, trainees receive about 4 hours of mandatory training. Depending on available government funding, "advanced training" is also provided for those interested. In the incentive trainings, the amount training ranges from 6 hours in Kentucky, covering most of the legal and regulatory issues as well as basic rate-setting and financing issues such as pricing. The Kansas model is very similar. In Ohio, all of these subjects are covered in a basic "Utility Management Training", but two additional trainings are offered that cover in depth financing and rate-setting and asset management training. Thus, a public official could conceivably receive upwards of 16 hours of training. Table 1, below, summarizes some of these differences.

Table 1: Differing training systems, incentives and training implications

State	Incentives	Legal Require-ments	Training Frequency	Contact Hours
Mississippi	Meet legal responsibility	Mandate BMT for public officials responsible for all community water systems serving <2500	20-30 sessions per year	2 days, 4 hours each: 8 contact hours
Kansas	State credit score. Certification.--	Voluntary	6-10 sessions per year	3 days, 3 hours each: 9 contact hours
Ohio	State credit score; CEUs	Voluntary	6-10 sessions per year	2 days, 5- 6 contact hours
Kentucky	Increase pay grade for Public Water District, Water User Association, and investor-owned utility commissioners	Voluntary	4 per year; plus as requested from communities.	PSC trainings, 6 contact hours;
Illinois	Encouragement from regulators and TA providers.	Voluntary	1 offered in 2009; On-demand	2 days, 5 hours each: 5-10 contact hours

Measuring Impacts

There are multiple reasons to measure impact assessment. Funders of trainings are obviously interested in knowing the return on their investment. Impact assessments can also assist in improving the design, delivery, and marketing of training. In Ohio, for instance, Ohio RCAP uses quotes gathered through their impact assessment in fliers advertising upcoming trainings. Likewise, comments on the impact survey have been used to amend the training design over time. (See, for instance, http://www.glrcap.org/image_upload/File/brochures/Fall%202009%20Training%20Brochure.pdf, retrieved on September 30, 2009.)

The first step in developing a BMT impact assessment tool is to explicitly conceptualize what impact is envisioned from conducting trainings. In other words, what **objectives** were envisioned as part of training? Were those objectives envisioned at the individual, board, water system, community, and state levels? How long was it envisioned that it would take for the training to make a difference? At each of these levels, was there a necessary critical mass that would lead to positive social change as a result of the training? What might be reasonable **indicators** of meeting the objectives at each of these levels of analylsis? What **measures** might be used to gauge whether the indicators are moving in the right or the wrong direction?

The measurement of impacts of BMT may be done at multiple points in the training process. Presuming that the goal of leadership BMT is to improve community water board member knowledge about the critical water system management issues, than a first key question is how many of those trained were actually public officials? In Ohio, the training organizers suspected after a little more than a year of training that the BMT attendees were largely water system operators and plant supervisors hoping to receive the necessary continuing education units (CEUs) to maintain operator certification. (Ohio EPA agreed to include BMT as a viable CEU to incentivize the training sessions.) Ohio began asking

for the title of attendees when they signed in. This confirmed their suspicion. On discovering this, Ohio RCAP worked with multiple of other partners to create incentives and political pressure for public officials to attend the BMT. They were able through these means to significantly improve participation by local government officials.

Impact assessment may also be carried out in conjunction with the trainings themselves. Pre-post training surveys can give the trainers an idea of what attendees are grasping during the trainings. They can also give a sense of what attendees enjoyed, what they didn't enjoy, and where they felt there were problems that could be fixed. Pre-post tests can also give a sense of what knowledge simply didn't sink in, and what did.

Once trainees leave the training center, it becomes harder to collect individualized information. Surveys or interviews of past trainees may provide valuable information about the impacts of BMT once people return to their home communities. However, attempts to do this are often extremely labor intensive. Response rates are frequently very low to such surveys, as they are an additional burden to people for whom water governance is a largely volunteer activity. Thus significant effort must go into encouraging people to fill out the survey. Further, survey design and analysis of responses can be tricky. Moving from individual impacts to impacts on community water systems is even more problematic. It involves thinking through the specific activities, policies and programs have been implemented as a result of the training and determining which of those indicate impacts of BMT. Sometimes the results are clear—for instance, based on knowledge gained from attending a BMT, local government officials from a hypothetical community maybe implemented new accounting procedures to better ensure that the community water system was covering costs. Often, however, the impact of training is more nebulous. For instance, the hypothetical board could have asked for assistance from technical assistance providers in financial assistance planning. Is this request due to BMT or other factors?

This problem is compounded when attempting to assess the overall effect of training on the capacity of a given state's small community water systems. Analysis of the Safe Drinking Water Information System (SDWIS) demonstrates no statistically significant difference between those states with robust training programs for public officials and state that lack such programs.

IX. Theory of Impact Assessment

> **Impact assessment has been defined by a well recognized manual as an activity "intended to determine more broadly whether the program had the desired effects on individuals, households, and institutions and whether those effects are attributable to the program intervention." (Baker, 2000 in CIFOR, n.d.)**

Given increasingly tight budgets, there has been increased interest in demonstrating the impacts of development activities. Professional associations such as the International Association of Impact Assessment (www.iaia.org), the American Evaluation Association (www.eval.org) and the Community Indicators Consortium (www.communityindicators.net) all play host to important debates and forums for discussing the best methods for impact assessment. There are a host of journals that address questions of impact assessment, specifically in the area of capacity development and leadership training. Peer reviewed journals such as the IAIA journal ***Impact Assessment and Project Appraisal,*** and the journal ***Social Indicators*** provide important insights on methods, outcomes and pitfalls in impact assessment.

As nonprofits, foundations, and government have become more interested in calculating the impacts of their investment in development activities, there have been a growing number of guide books about impact assessment. The W.K. Kellogg Foundation *Evaluation Handbook* (W.K. Kellogg Foundation, n.d.) provides a nice overview of processes and issues in impact evaluation. For an overview of impact assessments see Lampkin, et al. (2006). It is notable that some efforts have been made to apply the principles of outcome measurement to rural community development. Two

particularly good sources for this are “Building Development Capacity in Non-metropolitan Communities” (McGuire, et al. 1994) and “Measuring Community Success and Sustainability” (Flora, et al. 1999).

Impact assessment is the process of evaluating what happened as a result of particular activities. These activities can range from large construction projects (for instance, siting of a new energy facility or construction of a new road), introduction of a new technology or process (ozonation for water treatment, for instance), to efforts to build development capacity (such as leadership or local governance training). Depending on the type of training, there are differences in how impacts may be measured. For instance, to measure how people have been impacted by a technology or development around them may involve measurements of economic growth, perceived quality of life, etc. To measure the impacts of leadership training, one might rather measure numbers of projects started, the levels of self efficacy in addressing social problems, the ability to build cohesion across social groups, and ability to work with government to implement plans and proposals.

The impacts of construction or technology would focus on the impact in terms of material conditions (health, wealth, employment, mental health). Measuring the outcome of capacity development should focus on skills, abilities, partnerships, and system performance. Earl, et al. (2001) refer to this process as “outcome mapping.” They describe a twelve step, interactive process that begins with intentional design, moves through outcome and performance monitoring, then to evaluation planning which ultimately should feed back in to the intentional design.

Smutylo (2001) argues that it is important to consider stages of program development: inputs, activities, outputs, outcomes, Impacts. Table 2, below, lays out how this applies to leadership training. The **inputs** involve the process of **visioning** leadership training and how it fulfills the **mission** of improved community water system capacity. The next step is to think through the **partnerships**

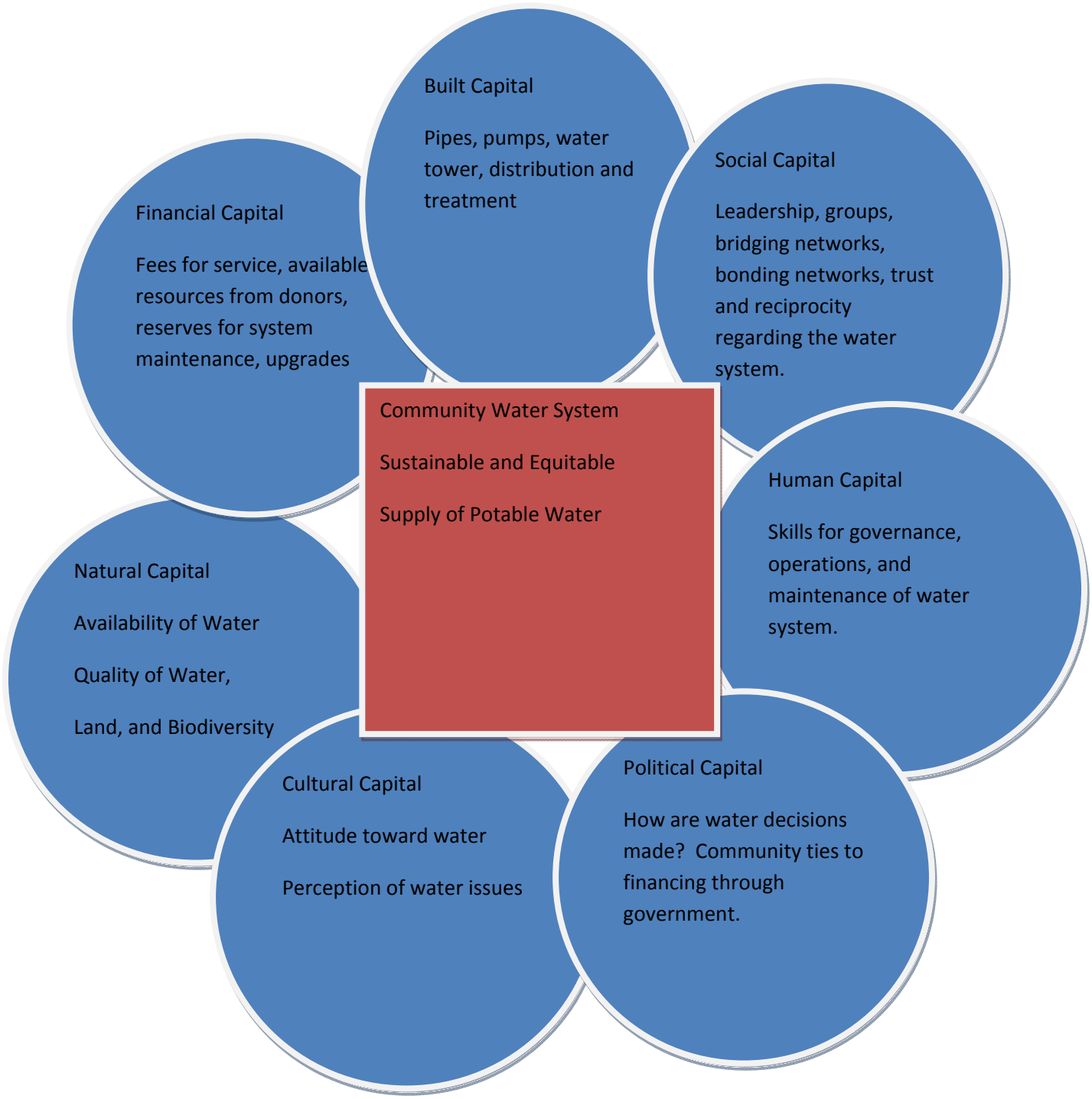
(b**oundary partners**) to implement training. These partners should be well suited to identify the **outcome challenges,** develop **strategy maps** and **organizational practices,** including putting in place systems to facilitate **outcome and performance monitoring.** These systems would be implemented on an ongoing basis and systematically analyzed at regular intervals. The **evaluation stage** would be carried out at the end of the first contract period and would be facilitated by **outcome and performance monitoring**. Based on the evaluation, the initiative could be either incrementally or dramatically changed going into the next phase.

Flora, et al. (2005) amended this model to look at the impact of community capacity development programs in conjunction with the National Rural Funders Collaborative (NRFC). Emery and Flora (2006) use the community capitals framework to address how capacity development impacts human skills, social interactions, cultural perceptions, and political connections, built and financial capital assets, and natural capital assets. (http://ncrcrd.org/LinkClick.aspx?fileticket=K%2blJLOScl%2fc%3d&tabid=87)

They argue that this may be done through measuring each of these assets during the context, process, and impact stage of an initiative. **Figure 2**, below, demonstrates how each of these assets relates to community water systems. From a theoretical perspective, the important piece to remember is that **outcome** and **impact** measurement must involve a measurement at the individual, community, socio-political system levels as well as assessments of built and financial assets. It is generally presumed that BMT will lead to improved water system knowledge by public officials, which will lead to better local management decisions, and improved water system performance. Outcome measurement can tell us if this is really true.

Figure 1: Three Stages of Outcome Mapping (Earl, et al. 2001, page 4)

Figure 2: Community Capitals Framework and Water Management



X. Applying Theory to Board and Management Training

There are several key steps in the measurement of impacts of BMT may be done at **multiple time points** in the training process. These should be juxtaposed against the **unit of analysis** (individual, community, state) (see Table 3, below):

Table 2: BMT Timing and Level of Impact Assessment

	Pre-Training	Beginning Training	End of training	6 months after training	Two years after training
Individual Board Member	Knowledge of water issues	Knowledge of water issues; percent of trainees who are local govt officials	Knowledge of water issues	Knowledge and engagement in water issues	Knowledge and engagement in water issues
Water Board	Percent trained; Board Actions			Percent trained; Board actions, policies and procedures	Percent trained; Board actions, policies and procedures
Community Water System	CWS policies, actions, and performance			Change in CWS policies, actions, and performance;	Change in CWS policies, actions, and performance
State wide CWS performance	Percent of CWS in compliance with SDWA regulations			Percent of CWS in compliance with SDWA regulations	Percent of CWS in compliance with SDWA regulations
	Capacity Development assessment scores			Capacity Development assessment scores	Capacity Development assessment scores

The Steps to BMT Assessment

Based on the theory summarized above, there are a number of key elements that are critical in assessing the impacts of leadership training. These are listed below:

a. Number and Type Trained – overall number per year and percent who are local officials
b. Reported Knowledge from Training – pre-post training survey
c. Capacity Assessment – MSU-KDHE capacity assessments
d. Measuring secondary impacts – What do statistics tell us about performance
e. Anecdotal measures – Using types of request for assistance to indicate performance

a) Number Trained: How Many and Who is Receiving Training

Presuming that a key sub-goal of BMT is to improve community water board member knowledge about the critical water system management issues, than a first key question is how many of those trained were actually public officials? In Ohio, the training organizers suspected after a little more than a year of training that the BMT attendees were largely water system operators and plant supervisors attending to receive the necessary continuing education units (CEUs) to maintain operator certification. (Ohio EPA agreed to include BMT as a viable CEU to incentivize the training sessions.) Ohio began asking for the title of attendees when they signed in. This confirmed their suspicion. On discovering this, Ohio RCAP, the agency implementing the training, worked with multiple of other partners to create publicity, incentives and political pressure for public officials to attend the BMT. They were able through these means to significantly improve participation by local government officials (Fishbaugh, 2009).

Key lesson: When holding training, ask attendees to sign in their name, affiliation, position/title, and contact information. This will be very important in a first assessment of how many have received training and whether the right people received training. Collecting detailed information

from training participants also provides the ability to follow up for later evaluation of outcomes and impacts.

b) Assessing the Immediate Impact: Was the right Knowledge Presented? Did Attendees Feel the Training Was Worthwhile

Impact assessment may also be carried out in conjunction with the trainings themselves. Pre-post training surveys can give the trainers an idea of what attendees are grasping during the trainings. Through analysis of the responses, the trainers can better understand where they are failing to communicate with trainees. They can apply training design knowledge to determine why this might be the case. For instance, key information may logically be introduced late in the day, when trainees are tired. Through assessment, this can be adjusted in future training.

Trainers may also want to have trainees **evaluate** training. A trainee evaluation can give a sense of what attendees enjoyed, what they didn't enjoy, and where they felt there were problems that could be fixed. Pre-post tests can also give a sense of what knowledge simply didn't sink in, and what did. Questions should pertain to the kinds of information and skills that participants hoped they would acquire from the training. Analysis can be helpful to the trainers in assessing the extent to which they are successfully conveying important information and resources. For instance, training evaluations in Ohio indicated that trainees really appreciated having time for networking and interactions with other participants. This could lead to amending training to provide more time for these unstructured activities, which can lead to import exchanges of site specific information and networking among community representatives and between community representatives, technical assistance providers, and primacy agency officials in attendance (Fishbaugh 2009). An example of a pre-training; post-training survey from Ohio is listed below.

Table 4: Sample Utility Management Training Pre-Post Training Questions (Fishbaugh, 2009)

QBS process applies to consultants when fee exceeds?
The common term for Ohio's Open meeting law?
All employees should have a written ?
A required annual report to all water customers is?
A SWAP stands for ?
An MCL is ?
A CAP to OhioEPA is?
A document used for a financial roadmap?
Acceptable water loss is?
Should neighboring rates factor into water rate design?

Once trainees leave the training center, it becomes harder to collect individualized information. Surveys or interviews of past trainees may provide valuable information about the impacts of BMT once people return to their home communities. However, attempts to do this are often extremely labor intensive, as response rates are naturally very low to such surveys thus significant effort must go into encouraging people to fill out the survey. Having said all of that, it is possible, and probably advisable to carry out surveys of training participants once they have been back in their home community and surveying on their water board . These surveys should be designed to measure:

1) Human capital – knowledge obtained

2) Social capital – the application of this knowledge through interactions with other board members and members of the community

3) Political capital – has the experience of the training impacted access to agencies and the resources that come with that access.

4) Cultural capital – has this resulted in activities that would demonstrate a change in community culture around water or the water system

5) Financial capital – financial management planning or programs

6) Built capital – upgrades or expansion of infrastructure

7) Natural capital – efforts to protect existing or potential drinking water.

Table 3, below, contains a set of sample questions from a survey of trainees. Note that the survey asks not only about personal capacities (human capital), but also about the extent to which the trainees have communicated with others (social capital). They also ask about the extent to which information regarding water system financing and capital improvement have been utilized (built, financial and natural capital). In this particular survey, no questions pertain to changes in political and cultural capital. This evaluation assesses the extent to which trainees utilized training materials. A post-training survey of participants could also ask them to describe actions taken as a water board that are attributable to the training. This could either be done through answering a narrative question on the survey, or through a telephone or face-to-face interview. Narrative questions could be transcribed, and coded for how they relate to each of the community capitals, or to other metrics such as whether actions taken related to regulatory compliance, asset management, financial management, capital improvement, workforce, etc. The coding could also be done on the basis of whether the systems changed according to a vision developed of the impact of BMT.

Table 3: Follow Up Participant Survey (Hogrewe 2009)

1. Did you share any of the knowledge gained from the Colorado Water Board workshop with other members of your board?

2. Have you located and used any of the resource materials listed in the training manual? If so, did you find the material useful?

    1. The manual is a big help and we are going to have them available for new board members.

    2. Gave me information I needed to understand more about a Special District.

3. For each training topic listed below, mark your current state of knowledge and readiness to serve on a water board compared with your pre-training state.

	More Confused Than Before	About the Same as Before	Better Prepared Now	N/A
Official Responsibilities and Liabilities	0	3	8	
Understanding Drinking Water Regulations in Colorado	0	6	6	
Basics of Drinking Water Systems	0	6	6	
Overseeing Operation and Maintenance Responsibilities	0	4	8	
Financial Management of Drinking Water Systems	0	7	5	
Managing a Staff	0	7	4	1
Communication with Staff, Public, and Regulators	0	4	7	1
Retaining Consultants and Other Support	0	7	4	1

C. Capacity Assessment – State Systems for Assessment the Impacts of BMT

In some states, BMT has been explicitly tied to capacity development programs. In places like Mississippi and Kansas, there are specific community water system capacity assessments that are either carried out by the primacy agency, or through a self-test that is certified by the state primacy agency. These capacity assessments tend to address TMF aspects water system capacity.

There should be coordination between those designing and implementing BMT and the primacy agency, to ensure congruence between training and assessment. The assessment may then be used to demonstrate water system progress toward capacity development. The assessment may also be used to encourage community water systems to improve performance. Further, aggregating results can help agencies and those working on training to determine not only the overall outcomes and impacts of BMT, but also priorities of emphasis in the training. Appendices 1 and 2 provide examples of assessment questions from Mississippi and Kansas.

D. Measuring Secondary Indicators of Impact and Outcome

The EPA SDWIS provides a really nice way to measure aggregate impacts of BMT, presuming that the ultimate goal is greater compliance with drinking water standards. Indeed, the SDWIS provides a calculation that shows the level of compliance by system size for each year. Reported violations are divided by all water systems in that size category. The greater the percent achieved through this calculation, the better the state community water systems are doing at complying with SDWA regulations. Table 4, below, demonstrates the calculation for the five states of Illinois, Kansas, Kentucky, Mississippi, and Ohio. The Table highlights one of the pitfalls of data source as an indicator. Note that margin of difference is very small between states. Furthermore, while Mississippi, which has the most robust BMT programs in the US always has the highest percentage, Illinois is often second despite a haphazard capacity development and BMT program.

Table 4: Compliance Ratio of Community Water Systems of Less than 10,000 2003-2008

FY	State	Viola-tions	Systems in Violation	Population In Violation	Total Systems with < 10000 hookups	Total Population Served by This Size System	Compliance Ratio for systems (GPRA-sys)
2008	IL	372	127	204,540	1,544	2,332,372	91.8%
	KS	351	112	148,198	863	834,516	87.0%
	KY	58	28	118,140	287	977,047	90.2%
	MS	128	74	110,925	1,069	1,812,616	93.1%
	OH	221	100	132,093	1,105	1,625,411	91.0%
2007	IL	499	148	193,773	1,548	2,331,998	90.4%
	KS	414	119	113,606	868	852,372	86.3%
	KY	57	27	106,560	289	982,654	90.7%
	MS	107	56	115,976	1,101	1,844,125	94.9%
	OH	304	121	157,910	1,118	1,619,582	89.2%
2006	IL	431	166	256,631	1,559	2,311,323	89.4%
	KS	515	114	139,525	870	826,782	86.9%
	KY	87	33	149,409	300	1,044,989	89.0%
	MS	39	35	69,852	1,104	1,810,899	96.8%
	OH	215	101	156,760	1,143	1,643,894	91.2%
2005	IL	509	174	267,771	1,564	2,317,113	88.9%
	KS	541	107	141,064	873	839,694	87.7%
	KY	168	46	186,108	307	1,049,234	85.0%
	MS	36	33	59,921	1,108	1,809,078	97.0%
	OH	239	115	190,518	1,155	1,650,959	90.0%
2004	IL	473	178	243,744	1,581	2,305,576	88.7%
	KS	175	93	104,365	880	850,251	89.4%
	KY	39	21	117,087	313	1,077,139	93.3%
	MS	19	18	38,171	1,121	1,771,309	98.4%
	OH	113	73	53,861	1,164	1,674,018	93.7%
2003	IL	389	138	171,406	1,587	2,275,706	91.3%
	KS	113	77	64,924	878	853,625	91.2%
	KY	18	14	75,876	321	1,089,223	95.6%
	MS	44	42	87,149	1,117	1,732,002	96.2%
	OH	123	73	90,005	1,182	1,701,135	93.8%
2003 Total		687	344	489,360	5,085	7,651,691	93.2%

E. Anecdotal measures – Using types of request for assistance to indicate performance

Since BMT is often carried out by trainers from technical assistance organizations such as the Rural Community Assistance Program (RCAP) or the National Rural Water Association (NRWA) state affiliates, it is also possible to gauge the impacts of leadership training through the types of assistance requested by communities. Capacity development could be seen as the extent to which local government understands the need for greater revenue to pay for a qualified operator, the need for better financial planning, and the need for asset management assistance. The extent to which these types of requests increase may be correlated to the implementation of BMT.

For instance, Ohio RCAP reports having an increasing number of requests for training with each additional year that they offer BMT courses, which may be seen as an indicator of interest in the trainings by the drinking water sector in general. RCAP reports that in each of the last 2 years they have received between 8 and 10 more requests for rate analysis. They have been asked by OEPA to assist with an asset management plan as a result. The number of general requests for assistance has also increased. The down side of this indicator, of course, is that it is highly unreliable. There could be a multiple of factors influencing whether community water systems request financing assistance. Ohio RCAP could, of course, ask contacts in the communities requesting financial planning assistance why they requested this assistance. If they mention the BMT, then it can be tabulated as an impact (what kind of assistance in how many communities). If not, there is no evidence that technical assistance requests in this community had anything to do with BMT.

F. Combining Measurements, Assessing Outcomes of BMT

The trick is to pick and choose, but also integrate these measures to better understand true outcomes and impacts of BMT in a given state. We have seen above that there are weaknesses to using purely quantitative, secondary data in assessing impact. On the other hand, there are clearly problems

with narrative data and cost-benefit calculations necessary for deciding to track down past training attendees and interviewing them. What is important in assessing the outcomes and impacts of BMT is that measurement must not be solely at the level of the individual, but also at the level of the community water system. Likewise, understanding the improvement in human capital, will not adequately depict improved water system capacity. Rather, some effort must be made to address the extent to which that knowledge has been expanded through social networks, how that has in turn changed local cultures, and how that has, in turn, revolutionized community water systems. Numerous tools have been presented in this manual. These may be, and should be adapted to local circumstances. But it is clear that we cannot verify the utility of training until we make efforts to measure the impacts.

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Appendices

a. MSU Capacity Assessment Programs
b. Kansas State Capacity Assessment Forms

Appendix A

Mississippi Department of Health
Bureau of Public Water Supply

STANDARD FORM

FY 2008 Public Water System Capacity Assessment Form

NOTE: This form must be completed whenever a routine sanitary survey of a public water system is conducted by a regional engineer of the Bureau of Public Water Supply

PWS ID#: _____ Class: ____ Survey Date: _____ County: _____

Public Water System: _____ Conn: _____

Certified Waterworks Operator: _____ Pop: _____

CAPACITY RATING DETERMINATION

Technical (T) Capacity Rating: [____] Managerial (M) Capacity Rating [____] Financial (F) Capacity Rating [____]

Capacity Rating $= \frac{T+M+F}{3} = \frac{\quad}{3} =$ **Overall Capacity Rating = _____**

Completed by on

Comments: _____

Technical Capacity Assessment	Point Scale	Point Award
[T1] 1) Was the water treatment process functioning properly? [Y N] (i.e. Is pH, iron, free chlorine, etc. within acceptable range?) **2)** Was needed water system equipment in place and functioning properly at the time of survey? (No significant deficiencies/adequacy of security)? [Y N] (**NOTE:** Equipment deficiencies must be identified in survey report.) (**NOTE:** All YESs required to receive point)	All Y - 1 pt. Else - 0 pt.	
[T2] Were records available to the regional engineer clearly showing that all water storage tanks have been inspected and cleaned or painted (if needed) within the past 10 years? [Y N NA]	Y - 1pt. N - 0pt.	
[T3] 1) Was the certified waterworks operator or his/her authorized representative present for the survey? [Y N] **2)** Was log book up to date and properly maintained and did it show that MDH Minimum JOB Guidelines for W. W. Operators were being met? [Y N] **3)** Was the water system properly maintained at the time of survey? [Y N] **4)** Did operator satisfactorily demonstrate to the regional engineer that he/she could fully perform all water quality tests required to properly operate this water system? [Y N] (**NOTE:** All YESs required to receive point)	All Y - 1 pt. Else - 0 pt.	
[T4] 1) Does water system routinely track water loss and were acceptable water loss records available for review by the regional engineer? [Y N] **2)** Is water system overloaded? (i.e. serving customers in excess of MDH approved design capacity)? [Y N] **3)** Was there any indication that the water system is/has been experiencing pressure problems in any part(s) of the distribution system? [Y N] (based on operator information, customer complaints, MDH records, other information) (**NOTE:** YES FOR #1 AND NOs FOR #2 & #3 required to receive point)	1)Y - pt. 2)N - pt. 3)N - pt.	
[T5] Does the water system have the ability to provide water during power outages? (i.e. generator, emergency tie-ins, etc.) [Y N] (**NOTE:** Must be documented on survey report)	Y - 1pt. N - 0pt.	
TECHNICAL CAPACITY RATING = [_____] (Total Points)		

Public Water System: _____ PWS ID #: _____

FY 2008 Public Water System Capacity Assessment Form Survey Date: _____

Managerial Capacity Assessment	Point Scale	Point Award
[M1] Were all SDWA required records maintained in a logical and orderly manner and available for review by the regional engineer during the survey? [Y N]	Y - 1pt. N - 0pt.	
[M2] **1)** Have acceptable written policies and procedures for operating this water system been formally adopted and were these policies available for review during the survey? [Y N] **2)** Have all board members (in office more than 12 months) completed Board Member Training? [Y N NA] **3)** Does the Board of Directors meet monthly and were minutes of Board meetings available for review during the survey? (**NOTE:** Quarterly meetings allowed if system has an officially designated full time manager) [Y N NA] (**NOTE:** ALL YESs or NAs required to receive point. NA - Not Applicable)	All Y - 1 pt. Else - 0 pt.	
[M3] Has the water system had any SDWA violations in the past 24 months? [Y N]	N - 1pt. Y - 0pt.	
[M4] Has the water system developed a long range improvements plan and was this plan available for review during the survey? [Y N]	Y - 1pt. N - 0pt.	
[M5] **1)** Does the water system have an effective cross connection control program in compliance with MDH regulations? [Y N] **2)** Was a copy of the MDH approved bacti site plan and lead/copper site plan available for review during the survey and do the bacti results clearly show that this approved plan is being followed? [Y N] (**NOTE:** All YESs required to receive point)	All Y - 1 pt. Else - 0 pt.	
MANAGERIAL CAPACITY RATING = [_____] (Total Points)		

Financial Capacity Assessment	Point Scale	Point Award
[F1] Has the water system raised water rates in the past 5 years? [Y N] (**NOTE:** Point may be awarded if the water system provides acceptable financial documentation clearly showing that a rate increase is not needed, i.e. revenue has consistently exceeded expenditures by at least 10%, etc.)	Y - 1pt. N - 0pt.	
[F2] Does the water system have an officially adopted policy requiring that water rates be routinely reviewed and adjusted as appropriate and was this policy available for review during the survey? [Y N]	Y - 1pt. N - 0pt.	
[F3] Does the water system have an officially adopted cut-off policy for customers who do not pay their water bills, was a copy of this policy available for review by the regional engineer, and do system records (cut-off lists, etc.) clearly show that the water system effectively implements this cut-off policy? [Y N]	Y - 1pt. N - 0pt.	
[F4] Was a copy of the water system's officially adopted annual budget available for review by the regional engineer and does the water system's financial accounting system clearly and accurately track the expenditure and receipt of funds? [Y N]	Y - 1pt. N - 0pt.	
[F5 - Municipal Systems] **1)** Is the municipality current in submitting audit reports to the State Auditor's Office? [Y N] **2)** Was a copy of the latest audit report available for review at the time of the survey? [Y N] **3)** Does this audit report clearly show that water and sewer fund account(s) are maintained separately from all other municipal accounts? [Y N] (**NOTE:** Yes answer to all questions required to receive point.)	All Y - 1 pt. Else - 0 pt.	
[F5 - Rural Systems] **1)** Has the rural water system filed the required financial reports with the State Auditor's Office and were these reports available for review? [Y N] **2)** Does the latest financial report show that receipts exceeded expenditures? [Y N] (**NOTE:** Yes answer to both questions required to receive point)	All Y - 1 pt. Else - 0 pt.	
FINANCIAL CAPACITY RATING = [_____] (Total Points)		

Mississippi Department of Health
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Technical (T) Capacity Rating: [____] Managerial (M) Capacity Rating [____] Financial (F) Capacity Rating [____]

Capacity Rating $= \frac{T+M+F}{3} = \frac{\quad}{3} =$

Overall Capacity Rating = _____

Completed by on

Comments: _____

Technical Capacity Assessment	Point Scale	Point Award
[T1] 1) Was the water treatment process functioning properly? [Y N] (i.e. Is pH, iron, free chlorine, etc. within acceptable range?) **2)** Was needed water system equipment in place and functioning properly at the time of survey? (No significant deficiencies/adequacy of security)? [Y N] (**NOTE:** Equipment deficiencies must be identified in survey report.) (**NOTE:** All YESs required to receive point)	All Y - 1 pt. Else - 0 pt.	
[T2] Were records available to the regional engineer clearly showing that all water storage tanks have been inspected and cleaned or painted (if needed) within the past 10 years? [Y N NA]	Y - 1pt. N - 0pt.	
[T3] 1) Was the certified waterworks operator or his/her authorized representative present for the survey? [Y N] **2)** Was log book up to date and properly maintained and did it show that MDH Minimum JOB Guidelines for W. W. Operators were being met? [Y N] **3)** Was the water system properly maintained at the time of survey? [Y N] **4)** Did operator satisfactorily demonstrate to the regional engineer that he/she could fully perform all water quality tests required to properly operate this water system? [Y N] (**NOTE:** All YESs required to receive point)	All Y - 1 pt. Else - 0 pt.	
[T4] 1) Does water system routinely track water loss and were acceptable water loss records available for review by the regional engineer? [Y N] **2)** Is water system overloaded? (i.e. serving customers in excess of MDH approved design capacity)? [Y N] **3)** Was there any indication that the water system is/has been experiencing pressure problems in any part(s) of the distribution system? [Y N] (based on operator information, customer complaints, MDH records, other information) (**NOTE:** YES FOR #1 AND NOs FOR #2 & #3 required to receive point)	1)Y - pt. 2)N - pt. 3)N - pt.	
[T5] Does the water system have the ability to provide water during power outages? (i.e. generator, emergency tie-ins, etc.) [Y N] (**NOTE:** Must be documented on survey report)	Y - 1pt. N - 0pt.	
TECHNICAL CAPACITY RATING = [_____] (Total Points)		

Attachement B: Kansas BMT Evaluation Materials

Table 1 – KanCap Classroom Training Evaluations Summary (KDHE 2008: 5)

Managerial Section Evaluation	1	2	3	4	5	9	NR	Total	254	Combined 1 & 2
Topics Covered (Q. 1 – Attachment C)	166	59	18	4	0	7	0	254		225
Percent (Q. 1)	65%	23%	7%	2%	0%	3%	0%	100%		89%
Worth Time (Q. 4 – Attachment C)	132	94	17	3	2	0	6	254		226
Percent (Q.4)	52%	37%	7%	1%	1%	0%	2%	100%		89%
Trainer Prepared (Q. 6 – Attachment C)	201	39	6	3	3	0	2	254		240
Percent (Q.6)	79%	15%	2%	1%	1%	0%	1%	100%		94%

Financial Section Evaluation	1	2	3	4	5	9	NR	Total	269	Combined 1 & 2
Topics Covered (Q. 1 – Attachment C)	133	95	30	7	1	3	0	269		228
Percent (Q.1)	49%	35%	11%	3%	0%	1%	0%	100%		85%
Worth Time (Q. 4 – Attachment C)	119	109	29	2	5	0	5	269		228
Percent (Q.4)	44%	41%	11%	1%	2%	0%	2%	100%		85%
Trainer Prepared (Q. 6 – Attachment C)	160	72	26	5	2	0	4	269		232
Percent (Q.6)	59%	27%	10%	2%	1%	0%	1%	100%		86%

Technical Section Evaluation	1	2	3	4	5	9	NR	Total	247	Combined 1 & 2
Topics Covered (Q. 1 – Attachment C)	132	80	16	3	2	14	0	247		212
Percent (Q.1)	53%	32%	6%	1%	1%	6%	0%	100%		86%
Worth Time (Q. 4 – Attachment C)	140	66	22	6	1	0	12	247		206
Percent (Q.4)	57%	27%	9%	2%	0%	0%	5%	100%		83%
Trainer Prepared (Q. 6 – Attachment C)	157	46	20	8	2	0	14	247		203
Percent (Q.6)	64%	19%	8%	3%	1%	0%	6%	100%		82%

Legend:

Topics Covered: 1 = Very Valuable through 5 = Not Valuable
Worth Time: 1 = Very Much through 5 = Very Little
Trainer Prepared: 1 = Very Much through 5 = Very Little
9 = No Opinion, NR = No Response, Combined 1 & 2. = Total of 1 & 2 Rankings

Table 2 – 2008 TFM Capacity Development Survey Summary (KDHE 2008: 11)

Total Possible Points on Survey		124
Highest Score (2 systems)		86
Lowest Score (2 systems)		2
Priority Ranking Summary		
Priority Category	**Points**	**Number of Systems**
High	40 or More Points	80 9.36%
Medium	20 to 39 Points	493 57.66%
Low	19 Points or Less	282 32.98%
Total Number of Surveys Analyzed		**855 100.00%**

Figure 1 - Survey Comparison by Priority Ranking for all Community Systems (KDHE 2008: 12)[1]

[1] Comparison of the 2002, 2005 and 2008 surveys of their progress toward achieving TFM capacity.

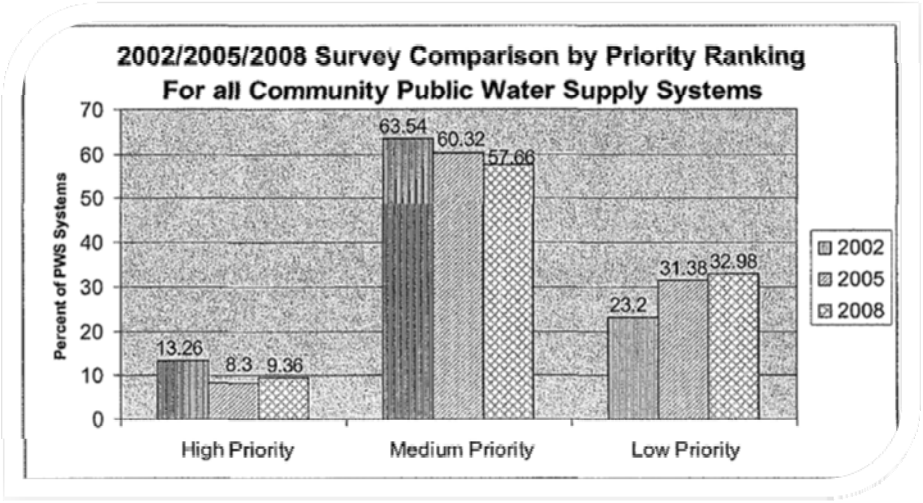

Table 3 - *2002/2005/2008* Capacity Development Survey Comparison (KDHE 2008: 9)

	2002 Survey	2005 Survey	2008 Survey
Surveys Mailed	904	909	887
Surveys Analyzed	875	819	855
Percent Analyzed	97%	90%	96%
Population 500 or Less	Total No. of Systems 465	Total No. of Systems 417	Total No. of Systems 454
High Priority	21% (97)	15% (63)	16% (72)
Medium Priority	69% (321)	66% (276)	64% (290)
Low Priority	10% (47)	19% (78)	20% (92)
Population 501 to 3,300	Total No. of Systems 333	Total No. of Systems 321	Total No. of Systems 321
High Priority	5% (16)	1% (4)	2% (6)
Medium Priority	60% (199)	56% (180)	52% (166)
Low Priority	35% (118)	43% (137)	46% (149)
Population 3,301 or More	Total No. of Systems 77	Total No. of Systems 81	Total No. of Systems 80
High Priority	4% (3)	1% (1)	3% (2)
Medium Priority	47% (36)	47% (38)	46% (37)
Low Priority	49% (38)	52% (42)	51% (41

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