

McGraw Hill
CONSTRUCTION

connecting people_projects_products

Water Infrastructure Asset Management:

Adopting Best Practices to Enable Better Investments



Premier Corporate Partner:

CH2MHILL®

Association Research Partners:



SmartMarket Report

McGraw-Hill Construction

President

Keith Fox

Vice President, Product Development

Kathryn E. Cassino

McGraw-Hill Construction Research & Analytics/ Industry Insights & Alliances

Vice President, Industry Insights & Alliances

Harvey M. Bernstein, F.ASCE, LEED AP

Senior Director, Research & Analytics

Burleigh Morton

Director, Green Content & Research Communications

Michele A. Russo, LEED AP

Reproduction or dissemination of any information contained herein is granted only by contract or prior written permission from McGraw-Hill Construction.

Copyright © 2013,
McGraw-Hill Construction,
ALL RIGHTS RESERVED

Water Infrastructure Asset Management: Adopting Best Practices to Enable Better Investments SmartMarket Report

Executive Editor

Harvey M. Bernstein, F.ASCE, LEED AP

Editorial Director

Michele A. Russo, LEED AP

Managing Editor

Donna Laquidara-Carr, Ph.D., LEED AP

Director, Design & Production

William Taylor

Manager, Content Operations

Juan Ramos

Art Director

Alison Lorenz

Contributing Art Director

AD-BOUTIQUE, INC.

Hisako Fujishima

Editor

Enver Fitch, LEED Green Associate

Contributors

Bruce Buckley

Katharine Logan

Research Project Manager

Susan Barnett, MRA, PRC

For further information on this
SmartMarket Report or any in
the series, please contact:

**McGraw-Hill Construction
Research & Analytics
34 Crosby Drive, Suite 201
Bedford, MA 01730**

1-800-591-4462

MHC_Analytics@mcgraw-hill.com

McGraw Hill CONSTRUCTION

About McGraw-Hill Construction

McGraw-Hill Construction's data, analytics, and media businesses—*Dodge, Sweets, Architectural Record, GreenSource, and Engineering News-Record*—create opportunities for owners, architects, engineers, contractors, building product manufacturers, and distributors to strengthen their market position, size their markets, prioritize prospects, and target and build relationships that will win more business. McGraw-Hill Construction serves more than one million customers through its trends and forecasts, industry news, and leading platform of construction data, benchmarks, and analytics.

To learn more,
visit www.construction.com.

Introduction

The water infrastructure sector can no longer afford to do business as usual, with the American Society of Civil Engineers currently predicting a \$84 billion annual capital gap for water infrastructure in the United States, due to aging systems and greater demands for water coupled with stricter environmental regulations. Adopting an asset management approach offers utilities a way to make better decisions about budgets and investments in assets and run their organizations more effectively.

This *SmartMarket Report* provides a powerful portrait of asset management adoption in the United States and Canada. **Instead of relying on a utility's self-definition of an asset management practice, the analysis identifies practitioners based on how many of 14 specific asset management practices defined in the report are currently used by a utility.** Thus, the use of asset management and the comparisons of practitioners and non-practitioners are based on actual activity.

Based on this, we can report that 65% of the respondents are doing four or more asset management practices, the minimum for designation as an asset management practitioner. However, only 18% of the respondents are doing 10 or more practices, demonstrating that there is a vanguard of leaders in the industry, but that wider adoption still needs to be encouraged for most utilities.

The results also demonstrate robust plans for adoption for many of the asset management practices by 2017. In fact, **one of the greatest areas of growth, for**

practitioners and non-practitioners alike, is the development of an asset management policy, with use by practitioners growing from 46% to 84% and use by non-practitioners growing from 5% to 59%. Clearly, this demonstrates a commitment to asset management adoption across the industry.

No doubt, the benefits being experienced by asset management practitioners have helped to encourage this adoption.

- 80% report an improved ability to explain and defend their budgets and investments.
- 67% have a better focus on priorities.

In addition, the findings reveal that **employing a higher level of asset management practices provides a wider range of benefits.** For example, 56% of those doing 10 or more practices report that they have reduced costs without sacrificing service levels, compared to 30% of those doing only four to six practices. This provides compelling support for the need to encourage greater adoption among practitioners and non-practitioners alike.

The need to address the poor condition of infrastructure assets is the main driver for wider industry implementation, selected by 39% as the single-most important factor influencing adoption. Increasing fiscal pressures also create the need for better investment and budget decisions, another important driver according to 25%. More data and education are the top strategies identified to increase adoption.

We would like to thank our research partner, CH2M HILL, and the participating associations, for helping us to bring this vital information to the industry.



Harvey M. Bernstein, F.ASCE, LEED AP
Vice President
Industry Insights & Alliances
McGraw-Hill Construction



Donna Laquidara-Carr, Ph.D., LEED AP
Manager, Industry Insights & Research Communications
McGraw-Hill Construction

Harvey M. Bernstein, F.ASCE, LEED AP has been a leader in the engineering and construction industry for over 30 years. Currently, he has lead responsibility for MHC's market research group as well as MHC's thought leadership initiatives in areas such as green building, BIM, interoperability, innovation and global construction markets. Previously, Bernstein served as the President and CEO

of the Civil Engineering Research Foundation. He currently serves as a member of the Princeton University Civil and Environmental Engineering Advisory Council and as a visiting Professor with the University of Reading's School of Construction Management and Engineering in England. Bernstein has an M.B.A. from Loyola College, an M.S. in engineering from Princeton University and a B.S. in civil engineering from

the New Jersey Institute of Technology.

Donna Laquidara-Carr, Ph.D., LEED AP, currently provides editorial direction, analysis and content to MHC's *SmartMarket Reports*, examining critical construction industry trends including BIM, risk management and green building. Prior to starting this position in 2008, she worked for nearly 20

years with MHC's Dodge division, where she gained insight into the construction news industry. From 2005–2008, she served as Editorial Training and Policy Manager, responsible for educating over 250 reporters on key trends in the industry. Laquidara-Carr has a Ph.D. from Tulane University, an M.A. from Boston University and a B.A. from Middlebury College.

Introduction

Water and wastewater utilities are vital to the success of the communities in which we live and work. In today's economy, utilities have been forced to tighten their belts. Meanwhile, systems continue to age and equipment is in dire need of repair or replacement. Ratepayers continue to demand enhanced services, yet they pressure utilities to hold the line on rates.

As one of the world's leading utility asset management consultants, CH2M HILL knows that, in the simplest terms, asset management practices save money, improve system reliability and reduce risks—all while enabling improved service. It's not only good management; it helps to make the case for budget and investment decisions.

At CH2M HILL, we're committed to advancing the water industry's understanding of asset management and its benefits. To learn how utilities are using asset management practices, we partnered with McGraw-Hill Construction (MHC) to conduct this study in conjunction with leading industry associations.

The online survey explored current or planned implementation of 14 asset management practices. Those found to be most effective include conducting condition assessments, developing policies and plans, using business cases, and developing asset registers to analyze performance

and to plan maintenance and capital investment strategies.

The study shows that utilities that have implemented a higher number of practices trend toward higher levels of planned rate increases by 2017, citing a greater ability to prioritize investments and the ability to better explain and justify budget and rate proposals to decision-makers.

Among the most interesting findings is the role that culture plays in the implementation of an effective program. Respondents emphasized that organizational resistance can be a barrier to implementation, so it's important for utilities to address this early in the program development process.

We thank MHC, the participating associations, survey respondents and leading practitioners who shared their experiences.

About CH2M HILL: *Employee-owned CH2M HILL is a global leader in consulting, design, design-build, operations and program management, concentrated in water, transportation, environmental, energy, facilities and resources. CH2M HILL delivers custom-tailored utility operations and maintenance services, ranging from asset management, facility optimization and organizational development consulting to hands-on facility management. The firm ranks at the top of ENR's lists in wastewater treatment, water supply, water treatment and desalination, and consulting, and earned the title Water Company of the Year at the 2012 Global Water Awards.*



John W. Fortin, LEED AP
Director
Asset Management and Reliability
CH2M HILL



Scott Haskins
Vice President and Director
Management and Operations Services Team
CH2M HILL

John W. Fortin, LEED AP is an asset management and reliability practitioner with over 26 years of facilities lifecycle experience. Fortin provides a practitioner's view to clients, sharing his successes at designing and implementing the asset management program for the Massachusetts Water Resources Authority's 1,000 million-gallon-per-day Deer Island plant. The award-winning project resulted in reduced costs, increased reliability and a shift to proactive work practices. He is nationally recognized for his

leadership in developing and implementing organizational change management programs required to establish a sustainable asset management culture. Fortin earned the Water Environment Federation's Arthur Sidney Bedell Award in 2007 for extraordinary service to a member association for his work in establishing the nation's first asset management committee in the water quality industry.

Scott Haskins is an industry leader in utility management, asset and risk manage-

ment, strategic planning, organizational development, performance management, benchmarking and alternative contracting. Haskins serves as strategic advisor for many of CH2M HILL's public-sector clients. He has consulted with and contributed to leading industry and research organizations, including the U.S. Environmental Protection Agency's Effective Utility Management Initiative Steering Committee. He is a member of the team tasked with benchmarking utility asset management

practices in North America and around the world for the Water Services Association of Australia and the International Water Association. Before joining CH2M HILL, Haskins concluded a 30-year career with the City of Seattle, where as Deputy Director of Seattle Public Utilities, he was responsible for water, wastewater and solid waste functions. He has authored numerous papers and co-authored American Water Works Association-published books on utility efficiency, performance and benchmarking.

TABLE OF CONTENTS

5 Executive Summary

- 5 Executive Summary
- 7 Recommendations

8 Data

9 Use of Asset Management Practices

- 9 Current Use of Asset Management Practices
- 10 Asset Management Spectrum of Use
- 11 Practices Involving Data and Technology to Support Asset Management Programs: Current and Future Use
- 12 Practices Involving Processes and Methods for Sound Investment Decisions: Current and Future Use
- 13 Practices Involving Strategy and Performance Measurement: Current and Future Use
- 14 Effectiveness of Asset Management Practices

18 Benefits

- 18 Benefits of Asset Management
- 20 Metrics Used to Track Asset Management Program Performance
- 24 **SIDEBAR Triple Bottom Line Triple Analysis Puts Decision Making in Context**

25 Making Decisions on Asset Investments

- 25 Strategies for Funding Asset Repairs, Maintenance, Renewal and Replacement
- 26 Top Methods for Determining Investments in New Assets
- 27 Importance of Risk Assessment in Investment Decisions about New or Existing Assets
- 28 Planning Horizons for Asset Strategy Planning
- 28 Projected Rate Increases Over the Next Five Years
- 29 Funding Sources for New Assets and Improvements to Existing Assets
- 32 **SIDEBAR Taking Risk Management to the Next Level Through Asset Management**

33 Drivers and Barriers

- 33 Organizational Issues Influencing the Decision to Adopt an Asset Management Approach
- 34 Top Drivers for Implementing Asset Management at Respondents' Utilities
- 35 Primary Driver for Implementing Asset Management in the Water Utility Market
- 36 Top Triggers for Asset Management Implementation
- 38 Ways to Encourage Greater Adoption of Asset Management by Water Utilities
- 40 Influence of Stakeholders on the Decision to Adopt Asset Management
- 41 **SIDEBAR Funding and Regulatory Challenges for U.S. Water Infrastructure**
- 42 Top Barriers to Asset Management Adoption at Respondents' Utilities
- 44 Top Barrier to Asset Management Adoption in the Water Infrastructure Industry
- 45 External Obstacles to Asset Management Implementation

CONTINUED



Left:
A sinkhole at SE McLoughlin Street in Portland, Oregon.

Below:
Hoover Dam, Columbus, Ohio



CONTINUED

48 Implementing Asset Management

- 48 Self-Assessment of Asset Management Practice
- 48 Number of Years Since Decision to Implement Asset Management
- 49 Profile of Organizations Implementing Asset Management
- 50 **SIDEBAR** Lessons for the U.S. Market From Australia’s Approach to Asset Management

51 Canadian Water Utilities

- 51 Differences in the U.S. and Canadian Markets

Case Studies

- 16 **Best Practices Drive a Strong Asset Management Program:**
Metropolitan Sewer District of Greater Cincinnati and Greater Cincinnati Water Works, Cincinnati, Ohio
- 22 **The Benefits of a Comprehensive Approach to Asset Management:**
The Department of Public Utilities, Columbus, Ohio
- 30 **Taking a Service-Level Approach to Implementing Asset Management:**
City of Regina, Saskatchewan, Canada
- 46 **Creating Teams to Make Better Decisions:**
Portland Water Bureau, Portland, Oregon

37 Glossary of Terms

52 Methodology

53 Resources

Front Cover: Monty Rakusen/ Cultura/Getty Images. This Page Left: Courtesy of the Portland Water Bureau. This Page Right: Courtesy of The Department of Public Utilities, Columbus, OH

Executive Summary

WATER INFRASTRUCTURE ASSET MANAGEMENT: ADOPTING BEST PRACTICES TO ENABLE BETTER INVESTMENTS

The industry is increasingly recognizing that asset management practices allow water utilities to serve their customers more effectively by encouraging greater financial, social and environmental responsibility.

A holistic asset management program can help water utilities make better investment decisions for the challenges that they face, including increasing capital-funding needs created by growing demands for their services, the ability to fulfill strict environmental regulations, and the risk of reduced funding due to budgetary concerns at the federal level.

Level of Implementation of Asset Management Practices in the Water Infrastructure Industry

The study listed 14 asset management practices and asked water utility respondents to identify how many they have currently implemented at their utilities: **65% report that they are doing four practices or more, the threshold used in the study to identify asset management practitioners.**

Despite this high level of practitioners, most utilities are still doing a relatively low number of practices. 43% of all practitioners are employing only four to six practices. In addition, while 10 practices are adopted by more than one third of overall respondents, the highest level of adoption for any one practice (such as use of a computerized maintenance management system) is 55%, suggesting that no single practice is widely common to the industry and demonstrating a strong opportunity for growth in the use of these practices.

Benefits Experienced by Asset Management Practitioners

Even asset management practitioners who use only a few practices see immediate benefits. The top two benefits are noted by a high percentage of all levels of practitioners, from those with a low involvement (an adoption of four to six practices) to those with a high involvement (an adoption of 10 or more practices).

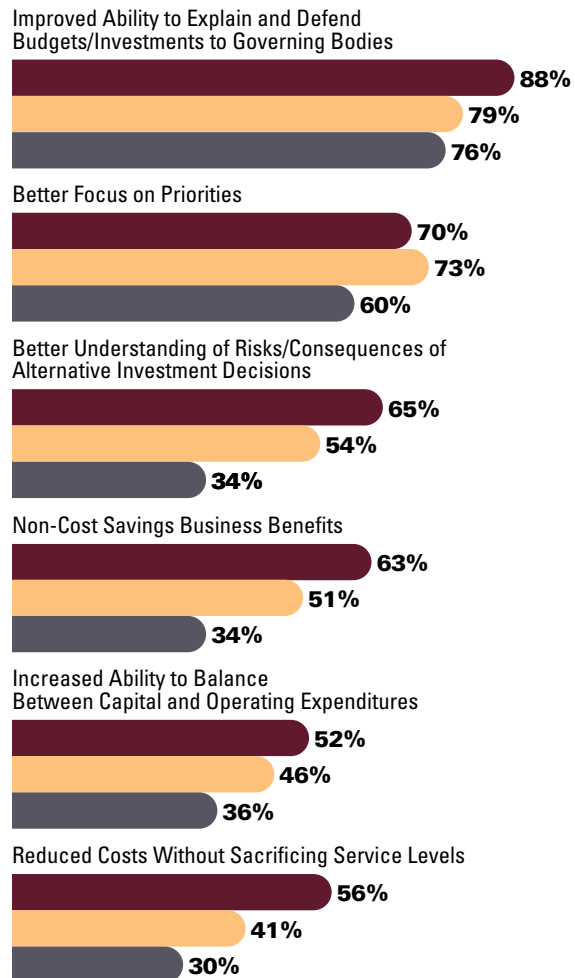
- **Improved Ability to Explain and Defend Budgets to Governing Bodies: Experienced by an average of 80% of practitioners**
- **Better Focus on Priorities: Experienced by an average of 67% of practitioners**

However, a more comprehensive implementation of asset management practices yields a wider range of benefits. More practitioners using 10 or more practices experience most of the top-seven benefits reviewed in the study, which clearly demonstrates that a greater commitment to implementing practices is rewarded with a wider range of benefits achieved.

Top Asset Management Benefits (According to Practitioners Along the Asset Management Spectrum)

Source: McGraw-Hill Construction, 2013

- High Involvement
- Medium Involvement
- Low Involvement



Most Effective Practices

Over 60% of the utilities that have implemented 11 of the 14 asset management practices find them to be effective, and all practices are found effective by over 50%. It is also notable that for nearly all the practices, less than 10% find them to be ineffective. This demonstrates the high level of return that utilities have achieved through their investments in asset management programs.

The practices selected by the largest percentage of their users as effective all form the core of a good asset management program, since these practices involve gathering and tracking data on the utilities' assets and creating an approach to govern specific assets classes or with the overall launch of an asset management program.

It is also notable that three of these practices have the largest percentage of non-practitioners that expect to adopt them by 2017—development of an asset management policy; asset-condition assessment; and strategic asset management plans.

Impact of Asset Management on Investment Planning

The results clearly demonstrate that adoption of asset management practices strongly impacts how utilities make decisions on asset investments.

- 67% of practitioners employ asset performance data when they allocate funds for asset repair, maintenance, renewal or replacement, compared to 46% of non-practitioners.
- 84% consider risk assessment an important element in their decisions on investments in new or existing assets, compared to 58% of non-practitioners.
- 59% of practitioners have a planning horizon of 10 years or more, compared to 33% of non-practitioners.

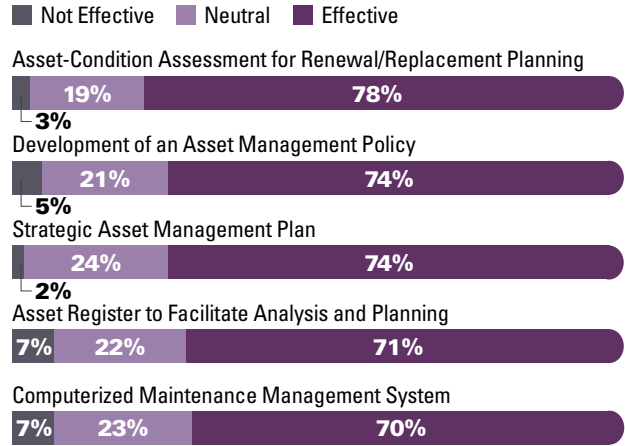
More information in the industry on the impact of asset management on investment planning can help encourage wider adoption of asset management practices.

Encouraging Greater Use of Asset Management Practices

Thirty-nine percent of all the survey respondents find that significant needs for replacing, upgrading or expanding infrastructure is the one key driver to encourage wider industry implementation of asset management programs. 25% regard the ability to determined maintenance budgets and capital-investment decisions as important. Education and a

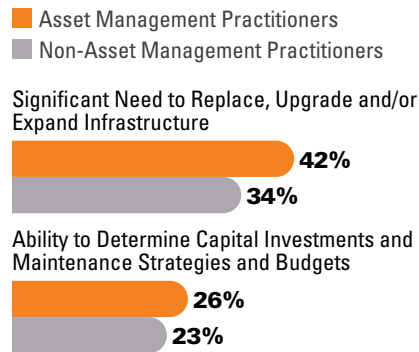
Top-Five Most Effective Asset Management Practices

Source: McGraw-Hill Construction, 2013



Top Factors Encouraging Greater Use of Asset Management Practices

Source: McGraw-Hill Construction, 2013



better understanding of the risks of aging assets are recognized as the most critical means of encouraging wider implementation.

Overall, these results demonstrate the strong potential for greater asset management implementation in North America due to concerns about the state and reliability of water infrastructure assets and the benefits of developing an asset management program.

Recommendations

To increase the implementation of asset management practices, the water infrastructure sector needs to provide utilities with more data and education on the benefits of asset management, and they need more funding and expanded regulations. Utilities should plan a gradual implementation, with an approach to engage the entire organization through a strong communication strategy.

Findings from the research, combined with the insights of the advanced asset management practitioners that participated in the in-depth interviews, reveal strategies to increase the use of asset management practices for the water infrastructure sector.

To Increase Adoption **PROVIDE MORE DATA AND EDUCATION**

Almost one quarter (24%) of the respondents who answered an open-ended question about encouraging asset management adoption agreed that having sound data on the costs of implementing an asset management program and on the benefits that they can achieve from adoption would encourage more interest in asset management.

In addition, 22% responding to that same question regard more education on asset management important to encourage wider adoption.

One of the advanced practitioners participating in in-depth interviews cautions that, because

asset management is a financial and economic topic, education about it needs to be presented in terms that appeal to engineers. He recommends that industry outreach focuses on “tak[ing] some of the cost-cutting stigma out of it and concentrat[ing] more on the value that it brings, particularly in times of economic hardship.”

SUPPORT ADDITIONAL FUNDING AND REGULATORY REQUIREMENTS

Nearly one quarter of non-asset management practitioners in response to the open-ended question about strategies to encourage adoption call for more funding, and 18% believe expanded regulatory requirements are necessary to increase implementation.

In fact, one of the in-depth interview participants argues that the U.S. needs a financial regulator, similar to Australia’s approach (see page 50), to see wider use of asset management. Otherwise, he states, “We are just doing it out of the goodness of our hearts. Without that external

hammer, [this will be] a constant problem.”

To Implement Successfully **IMPLEMENT GRADUALLY**

Many of the advanced practitioners participating in the in-depth interviews recommend that utilities implement asset management gradually. Demonstrating benefits on pilot projects can gain support for asset management throughout the organization. One states, “You’ll never have the data you need. You’re never going to get everybody in the organization to agree on it. The best way to do this is to just get started...because you achieve some results right away, you can get 80 percent of the benefits for 20 percent of the effort.”

ENGAGE THE ENTIRE ORGANIZATION

Responses from the in-depth interview participants also demonstrate the need to engage the entire organization. One participant says, “You have to have the whole utility on board, or else it doesn’t work, and it is difficult to build that trust and education. That boils down to

change management.”

Another describes the importance of changing the ways that all staff approach their job, “[Asset management] is not a program that is assigned to an individual or a group of individuals within a company. This is a way of doing business. This is a way in which you manage the operation of your organization. People have to approach it from that standpoint.”

The utility’s leadership must be included in this effort. One in-depth interview participant describes the impact of their efforts to engage his utility’s executive board: “We saw a pronounced shift over a two-year period.... No longer were they questioning why we were doing things. They were asking better questions to make us do a better job.”

CONTINUE COMMUNICATING

Initial training and change management must be followed up by constant reinforcement and communication to demonstrate an organization’s commitment to an asset management approach. ■

Data: Introduction

In 2011 the American Society of Civil Engineers (ASCE) released *Failure to Act: The Economic Impact of Current Investment Trends in Water and Wastewater Infrastructure*. This report revealed that in 2010, a \$54 billion annual capital gap existed for the water infrastructure sector, and, assuming that levels of funding remain the same, the report forecasted that this gap would grow to \$84.4 billion by 2020 and \$143.7 billion by 2040. Despite the dire need for greater investment, fiscal austerity at the state and federal levels continue to make increased funding unlikely.

Even so, the continued need to satisfy strict environmental regulations for water has added to financial pressure on utilities. Concerns about aging infrastructure, increased water use and the need for new capacity also continue to grow.

In the last 10 years, a growing number of utilities have begun to adopt advanced asset management practices to help them address these concerns. **Asset management, as the term is used in this *SmartMarket Report*, describes a set of practices and methods for delivering desired services to residents and businesses, at the lowest lifecycle costs (including environmental and social costs), while managing risk to an acceptable level.** In addition to their use in water infrastructure, asset management practices are easily applied to roads, transit, facilities and other infrastructure sectors.

The emphasis on low lifecycle costs and risk management frequently allows utilities using asset management practices to reduce costs with no reduction in service levels. This includes improving their approach to maintaining their existing infrastructure based on data on asset conditions and risk analyses, as well as considering multiple solutions to problems to find the most financially, socially and environmentally responsible choices.

As the results demonstrate in this report, not only have many utilities begun employing asset management practices, but that introduction has also led to a high level of interest in adopting additional practices within the next five years. The results also reveal the benefits to utilities that come from adopting asset management, even by those that are still employing a relatively low level of asset management practices. However, the results also indicate that the number of benefits experienced increases with more advanced implementation. In addition, by comparing asset management practitioners to non-practitioners, the results reveal opportunities to encourage greater adoption by those not currently invested in these practices.

Note About the Data

The research included insights from 451 respondents from utilities in the water infrastructure sector in the U.S. and Canada to indicate whether they currently use 14 advanced asset management practices (see page 9) in order to determine their levels of asset management implementation.

- Respondents currently using four of these practices or more are considered asset management practitioners for the purpose of this analysis. The questions that they were asked for the remainder of the survey were designed for practitioners. For example, they were asked what drivers and barriers that they experienced during their implementation of asset management.
- Respondents using three practices or less are considered non-practitioners for the purposes of this analysis. The remaining survey questions that they answered were designed for those who do not yet have a full asset management program in place. For example, they were asked what drivers would encourage them to implement an asset management program and what barriers would prevent them from doing so.

The questions were designed so that a comparison could be made of factors like the drivers and barriers affecting the respondents who have an asset management program in place (practitioners) and those who do not (non-practitioners).

In addition, practitioners have also been grouped into an asset management spectrum by the number of practices they have adopted from low (4–6 practices) to high (10 or more practices). For more information on the groupings by level of practices implemented, see page 10.

Finally, there are references to in-depth interviews conducted with five advanced asset management practitioners throughout the study. These confidential interviews provide insights into the full implications of the survey results.

For more detailed information on the profile of survey and in-depth interview participants, see the methodology on page 52.

Data: Use of Asset Management Practices

Current Use of Asset Management Practices

WATER INFRASTRUCTURE ASSET MANAGEMENT: ADOPTING BEST PRACTICES TO ENABLE BETTER INVESTMENTS DATA

The asset management survey identified 14 advanced asset management practices (listed in the chart at right) in order to gauge the level of asset management adoption by water utilities in the United States and Canada. These practices form the basis for the rest of the analysis in this study, examining the different patterns among those who do four or more of these practices, identified as asset management practitioners, and those doing three practices or less, identified as non-asset management practitioners.

Interestingly, 10 of these practices are adopted by more than one third of the overall respondents, but none are adopted by two-thirds. This suggests that nearly all the respondents are doing some of these practices, but there is no single practice common to most of the industry.

This finding may bode well for wider adoption of asset management in the future. Advanced asset management in-depth interview participants affirm that initially adopting a few practices is a good way to demonstrate the benefits of an asset management approach. Once the benefits of asset management are demonstrated, it is easier to convince an organization to invest in the use of more practices.

Most Widely Used Asset Management Practices

Among all the survey respondents, the only asset management practices adopted by more than 50% are the use of a computerized maintenance management system and asset condition assessment for renewal and replacement planning. These practices, and many of the others, will be individually analyzed on pages 11 through 13. However, it is clear that the broadest level of interest is involved in gauging and tracking asset performance.

For definitions of some of the technical terminology used in the practices, see page 37.

Variation by Size of Utility (By Population)

In general, larger utilities are far more likely to do more asset management practices than smaller utilities.

- Utilities serving a population of 50,000 or less:
 - An average of four practices
- Serving a population of more than 50,000 to 500,000:
 - An average of six practices
- Serving a population of more than 500,000:
 - An average of seven practices

Asset Management Practices Currently in Use

Source: McGraw-Hill Construction, 2013



Use of Asset Management Practices

Current Use of Asset Management Practices

CONTINUED

WATER INFRASTRUCTURE ASSET MANAGEMENT: ADOPTING BEST PRACTICES TO ENABLE BETTER INVESTMENTS DATA

This finding holds true with other measurements of utility size, with statistically significant increases in the number of practices also evident in utilities with more employees and higher total revenues.

Utilities with higher projected capital improvement spending over the next five years in both water and wastewater services, especially those with spending projected at \$50 million or more, are also on average using a statistically higher number of practices than those with smaller spending, again another measure of how larger utilities are adopting more practices.

Variation by Region

There are notable differences between different U.S. regions, with the Midwest reporting lower adoption levels compared to other regions, particularly the East and the South.

Variation by Services Provided (Drinking Water Versus Wastewater)

It is worth noting that there is no variation in the overall number of practices in use between utilities that engage solely in drinking water supply and treatment versus those that offer water and wastewater services.

Asset Management Spectrum of Use

Sixty-five percent of the survey participants are using four or more asset management practices, which is the minimum to be designated as an asset management practitioner.

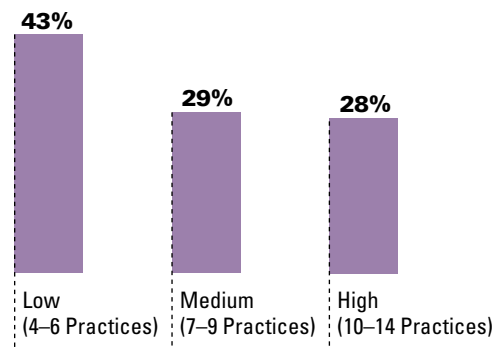
In addition to drawing distinctions between the experiences of asset management practitioners and non-practitioners, the data also demonstrate the varying levels of intensity of use of practices by asset management practitioners. These levels of intensity can be divided into low-, medium- and high-intensity users (see the spectrum at right). With 43% of practitioners on the low end of the spectrum, it is clear that there is need for greater adoption of asset management practices, even among practitioners.

Twenty-eight percent of the asset management practitioners are high-level practitioners, demonstrating that there is a significant portion of the industry with asset management expertise but also revealing the potential for continued growth in asset management practice adoption. **High-level practitioners account for 18% of the survey respondents as a whole.**

Examining the different experiences of these asset management practitioners provides insights into how the degree of practice use impacts the benefits and challenges of the approach. The range across the spectrum demonstrates the opportunity for greater adoption of asset management practices, even among practitioners.

Asset Management Spectrum (Among Asset Management Practitioners)

Source: McGraw-Hill Construction, 2013



Practices Involving Data and Technology to Support Asset Management Programs: Current and Future Use

Three of the 14 asset management practices help utilities to gather and record data to support their asset management programs, as well as the technologies that they use to accomplish these tasks. **All the technology and data practices are currently widely adopted in the industry, ranking first, second and fourth of all the practices included in the survey (see page 9), and these practices expect to see high use in the future.**

Wide adoption of the technology and data practices is critical to increased implementation of asset management because the data that they provide form the foundation for many of the practices involving processes and methods for sound decisions, as well as those practices focused on strategies.

Currently, use of a computerized maintenance management system (CMMS) is the most widely adopted practice among both those practicing asset management and non-practitioners. As the advanced practitioners that participated in the in-depth interviews reveal, the analysis of data from a CMMS can support more advanced practices, including the use of business cases, advanced risk assessment and maintenance initiatives. However, several in-depth interview respondents report needing to optimize their use of their CMMS to achieve the full benefit from this technology. (For the definition of a CMMS, see the glossary on page 37.)

However, by 2017 asset condition assessment is expected to be used by the same percentage of asset management practitioners (92%) that will use a CMMS, and among non-practitioners, asset condition assessment will be the most widely used practice, with over two-thirds (68%) expecting this practice to be in use. Respondents are also more familiar with asset-condition assessment than the other options, with only 2% of asset management practitioners and 8% of non-practitioners uncertain about whether they are currently employing this practice, which is the lowest percentage of any of the 14 practices provided in the survey. Asset condition assessment is fundamental to understand maintenance and replacement needs and would be at the center of any advanced asset management program, and the industry response clearly reflects that importance.

In contrast, **of the three data and technology practices, the highest percentage of respondents are unfamiliar with asset registers, with 12% of practitioners and 22% of non-practitioners uncertain about the use of this practice at their utilities.** However, despite this lack of familiarity, adoption levels are still high for the future,

Current and Future Use of Asset Management Practices: Data and Technology Practices to Support Programs

Source: McGraw-Hill Construction, 2013

■ Already Implemented ■ Plan to Implement by 2017

Computerized Maintenance Management System



Asset-Condition Assessment for Renewal/Replacement Planning



Asset Register to Facilitate Analysis and Planning



with nearly half of non-practitioners (49%) and 77% of practitioners expecting to use asset registers by 2017. As one advanced practitioner affirmed in an in-depth interview, knowledge of your total assets is critical to managing them properly, and an asset register provides this knowledge.

Variation by Line of Business

A significantly higher percentage of utilities offering both water and wastewater services (59%) currently use a CMMS compared to those that provide just water services (46%). However, greater use in the water sector that is expected by 2017 will eliminate any significant differences.

Practices Involving Processes and Methods for Sound Investment Decisions: Current and Future Use

Five of the 14 asset management practices employ processes and methods to make sound investment decisions. Since financial benefits as well as the ability to explain investments to stakeholders result from these practices, it is not surprising that among practitioners, use is already high for four out of five of these practices, and the expected adoption of each by 2017 ranges from 74% to 83% of respondents.

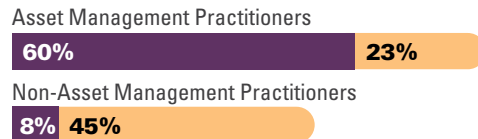
- Business Cases for Operations and Maintenance (O&M) and Capital Improvement Planning (CIP) Investments: 90% of those at the high end of the asset management spectrum of use (doing 10 practices or more) employ business cases, second only to asset condition assessment,** demonstrating that it is an essential part of an advanced asset management practice. However, the intensive nature of the process may explain why use of business cases ranks much lower among non-practitioners, both in current use and future adoption.
- Staff Training: 83% of asset management practitioners expect to be conducting staff training on asset management by 2017, the highest level among the five activities in this category.** In addition, while current use of training is relatively low among non-practitioners, a high percentage (45%) expect to be offering it by 2017, which is likely to support the relatively high expected level of adoption for many other practices. In fact, most of the advanced practitioners that participated in the in-depth interviews considered training the most essential component of a successful asset management program.
- Optimization of the Balance Between O&M and CIP Investments: 19% of non-practitioners report using this practice, the highest in this category and the second highest overall.** However, many may find that their ability to optimize improves when they employ other asset management practices that will allow them to gain more information about their assets.
- Reliability-Centered Maintenance (RCM):** RCM has the lowest level of current adoption, both among asset management practitioners and non-practitioners, and very low percentages of adoption are expected by 2017. Almost half (46%) of non-practitioners have no plans to implement this practice, and over one third (34%) do not know whether their utilities have adopted it or not. Clearly, more education on this practice is required in the industry, as well as ways to make it more assessable to practitioners and non-practitioners alike. (See page 37 for a definition of RCM.)

Current and Future Use of Asset Management Practices: Processes and Methods for Sound Investment Decisions

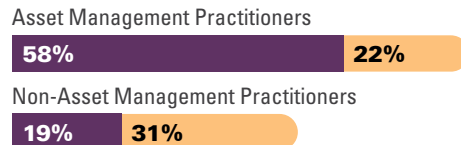
Source: McGraw-Hill Construction, 2013

■ Already Implemented ■ Plan to Implement by 2017

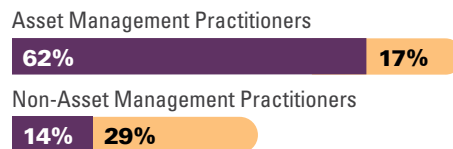
Staff Training and Development on Asset Management



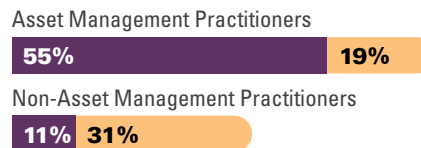
Optimization of the Balance Between Operations and Maintenance (O&M) and Capital Improvement Plan (CIP) Investments



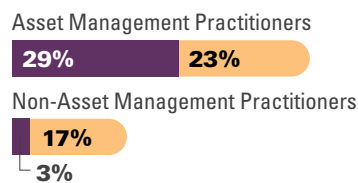
Business Cases for O&M and CIP Investments



Consideration of Risks and Consequences of Alternative Investment/Budget Decisions



Reliability-Centered Maintenance



WATER INFRASTRUCTURE ASSET MANAGEMENT: ADOPTING BEST PRACTICES TO ENABLE BETTER INVESTMENTS DATA

Practices Involving Strategy and Performance Measurement: Current and Future Use

Six of the 14 asset management practices help utilities to determine the strategy of their approaches to managing their assets and measuring performance. While there are exceptions, most of these practices are used less by both practitioners and non-practitioners alike. This makes sense since to build a strategy, it is helpful to have employed other practices first.

However, the robust level of adoption expected for many of these practices by 2017 suggests that taking a strategic approach to assets is a rising trend in the water infrastructure sector.

- **Development of an Asset Management Policy:** While less than half of the practitioners currently have an asset management policy, 38% expect to develop one by 2017—one of the strongest areas of growth for the practitioners. Non-practitioners currently have lower adoption levels but will experience dramatic growth as well. The rise in those expecting to develop an asset management policy suggests that the industry is beginning to recognize the importance of asset management and the need for a more comprehensive approach.
- **Strategic Asset Management Plans (SAMPs):** According to the Water Environment Research Foundation’s 2009 *Compendium of Best Practices in Water Infrastructure Asset Management*, a SAMP is a short-term planning document that guides the management of a category of assets to meet defined objectives. Because of this, a SAMP may be part of a utility’s approach to meet the requirements of a consent decree (see page 37 for a definition), which may explain why SAMPs are currently more widely adopted by practitioners than asset management policies. However, within five years, the differential will close, with policy adoption edging out SAMPs.
- **Consideration of Environmental, Social and Economic Costs and Benefits:** For practitioners, taking a triple bottom line approach has the highest percentage of current use of all the practices in this category, but the estimation of use by 2017 drops it to fourth out of the six practices. This may reflect the challenge of creating tools to adequately measure environmental and social benefits. For more information, see page 24.

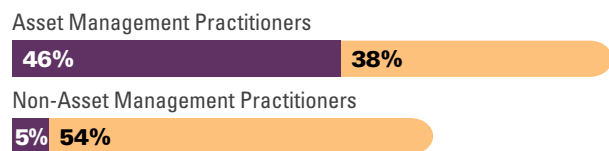
It is also notable that a high percentage of both practitioners (20%) and non-practitioners (29%) are uncertain about their utility’s use of customer and asset service-level development, suggesting that further education on this topic could increase the frequency of its use.

Current and Future Use of Asset Management Practices: Strategy and Performance Measurement Practices

Source: McGraw-Hill Construction, 2013

■ Already Implemented ■ Plan to Implement by 2017

Development of an Asset Management Policy



Strategic Asset Management Plans



Developing and Monitoring Customer Service and Asset Service-Level Performance Measures



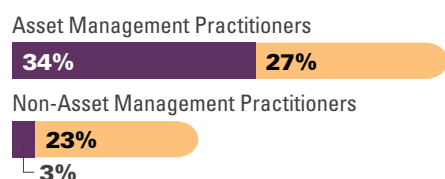
Consideration of Environmental, Social and Economic Costs and Benefits



Benchmarking and/or a Needs Assessment to Establish an Asset Management Implementation Plan



Customer and Asset Service-Level Development



Effectiveness of Asset Management Practices

The effectiveness of the 14 asset management practices was asked only of asset management practitioners who reported using a specific practice at their utility. The chart at right reflects the percentages of those using these practices who found them to be strongly effective. See page 37 for a glossary of the more technical terminology included in the list of practices.

Technology and Data Practices

The percentages of respondents using these practices who consider them effective mirror the levels of current and future use by the practitioners, suggesting that the ability of these practices to be perceived to be effective has positively impacted their use.

ASSET CONDITION ASSESSMENT FOR RENEWAL/REPLACEMENT PLANNING

While this ranked second highest in current usage, the highest percentage of respondents (78%) find it to be an effective practice. This may account for why 92% expect to be using this approach by 2017 (see page 11). Understanding the conditions of assets is one of the key starting points for developing an asset management program.

■ **Variation by Position on the Asset Management**

Spectrum: This is one of eight practices for which a significantly higher percentage of high-level practitioners find it quite effective compared to the low-level practitioners that report the same.

- High-Level Practitioners: 85%
- Low-Level: 73%

For this and the other seven practices, this finding suggests that a more advanced, holistic approach to asset management may increase the positive impact of these individual practices.

■ **Variation by Type of Service:**

- Drinking Water Services Only: 84% find it highly effective.
- Drinking Water and Wastewater Services: 75% find it highly effective.

ASSET REGISTER TO FACILITATE ANALYSIS AND PLANNING

This is widely recognized by all users as important, with no differences across the asset management spectrum of use, reinforcing its role as a key practice for launching an asset management program because it can be effective even for those with little experience.

Effectiveness of Asset Management Practices

(According to Asset Management Practitioners)

Source: McGraw-Hill Construction, 2013

■ Not Effective ■ Neutral ■ Effective

Technology and Data Practices to Support the Program

Asset-Condition Assessment for Renewal/Replacement Planning



Asset Register to Facilitate Analysis and Planning



Computerized Maintenance Management System



Strategy and Performance Measurement Practices

Development of an Asset Management Policy



Strategic Asset Management Plan



Customer and Asset Service-Level Development



Developing and Monitoring Customer Service and Asset Service-Level Performance Measures



Consideration of Environmental, Social and Economic Costs and Benefits



Benchmarking and/or a Needs Assessment to Establish an Asset Management Implementation Plan



Processes and Methods for Sound Investment Decisions

Business Cases for Operations and Maintenance (O&M) and Capital Improvement Plan (CIP) Investments



Optimization of the Balance Between O&M and CIP



Reliability-Centered Maintenance



Consideration of Risks and Consequences of Alternative Investment/Budget Decisions



Staff Training and Development on Asset Management



Use of Asset Management Practices

Effectiveness of Asset Management Practices

CONTINUED

WATER INFRASTRUCTURE ASSET MANAGEMENT: ADOPTING BEST PRACTICES TO ENABLE BETTER INVESTMENTS DATA

COMPUTERIZED MAINTENANCE MANAGEMENT SYSTEM (CMMS)

Among the advanced practitioners who participated in the in-depth interviews, several noted that the development of their asset management program included improving the effectiveness of their use of a CMMS. Therefore, it is not surprising to note that a much higher percentage of high-level asset management practitioners in the survey (83%) find their CMMS to be effective compared to low-level practitioners (66%).

Strategy and Performance Measurement Practices

Unlike the technology and data practices, several of the strategy and performance measurement practices rank more strongly in terms of the percentage of respondents that consider them effective than in terms of their overall use.

With the few exceptions noted below, there are also few statistically significant differentials in the percentage of respondents who find these practices effective across the asset management spectrum. This finding supports the case for wider adoption of these practices, even among respondents early in the process of adopting asset management practices, because they can be quite effective without having to build on other practices.

DEVELOPMENT OF AN ASSET MANAGEMENT POLICY

Tied for second overall with 74% who consider it effective, developing a policy is a foundational practice that can positively impact the effectiveness of other practices. Recognition of this impact may explain why those at the high level of practice adoption find it so effective.

■ Variation by Position on the Asset Management

Spectrum of Use:

- High-Level Practitioners: 83% find this to be effective.
- Low-Level: 52%

■ Variation by Type of Service:

- Drinking Water Services Only: 88% find it to be effective.
- Drinking Water and Wastewater Services: 68%

STRATEGIC ASSET MANAGEMENT PLAN (SAMP)

SAMPs are also found effective by 74% of respondents overall, and a higher percentage of practitioners at the high end of the asset management spectrum of use (79%) also found them effective than those on the low end (62%) do. Since SAMPs help organizations incorporate new

practices as they focus on how to improve a specific asset category, SAMPs may also encourage greater involvement in asset management practices overall.

CUSTOMER AND ASSET SERVICE LEVELS

Development of customer and asset service levels is a little used practice:

- Used by 34% of the asset manager practitioners
- 20% do not know whether their utilities had adopted it, the second-highest level of uncertainty among practitioners for any individual practice.

With about two-thirds (65%) of those using this practice finding it effective, and with no notable difference across the asset management spectrum, this practice has the potential to gain wider traction even among those who are still at a low level of asset management practice with more information about its effectiveness and use.

BENCHMARKING/NEEDS ASSESSMENT

This practice has the highest percentage (38%) of respondents who are neutral about its effectiveness.

Processes and Methods for Sound Investment Decisions

With a higher percentage of asset management practitioners at the high end of the spectrum finding four out of five of the practices that support investment decisions to be more effective, it is clear that better decision making builds upon the impact of other practices.

BUSINESS CASES

Eighty-one percent of high-level practitioners find using business cases effective, compared to 62% of medium- and low-level practitioners. Business cases were also considered most effective by several of the advanced participants in the in-depth interviews. According to one, a business case “pulls together” triple bottom line evaluations, lifecycle and O&M evaluations and risk analyses.

OPTIMIZATION OF THE BALANCE BETWEEN O&M AND CIP INVESTMENTS

Strikingly, 87% of the high-level practitioners consider this effective, far more than medium- (68%) and low-level (60%) practitioners.

ADDITIONAL PRACTICES CONSIDERED MORE EFFECTIVE BY HIGH-LEVEL USERS

- **Risks and Consequences of Alternative Investments:** Considered effective by 80% of high-level practitioners
- **Staff Training:** Considered effective by 74% of them

Best Practices Drive a Strong Asset Management Program

Metropolitan Sewer District of Greater Cincinnati and Greater Cincinnati Water Works

CINCINNATI, OHIO

WATER INFRASTRUCTURE ASSET MANAGEMENT: ADOPTING BEST PRACTICES TO ENABLE BETTER INVESTMENTS

Like many other cities in the United States, Cincinnati faces challenges in meeting the requirements of the Clean Water Act. The Metropolitan Sewer District of Greater Cincinnati (MSD) was issued a consent decree by the federal government, and the capital investments to meet its requirements, including a new proposed tunnel, were daunting. In its search for more affordable solutions, MSD launched an asset management program in 2007.

Biju George, deputy director at the MSD and interim director at the Greater Cincinnati Water Works (GCWW), reports that adoption of an asset management program allowed the MSD to negotiate using “the best solutions that would lower the cost to own and operate the assets long-term,”—solutions that avoided the costly proposed tunnel, saving the

citizens of Cincinnati millions of dollars.

Still, meeting the requirements of the consent decree required the MSD to undertake a large number of projects, and George’s team needed to find strong solutions that could lower lifecycle costs. Asset management played an important role in accomplishing these goals.

Implementing Asset Management for Wastewater

George states that the only challenge that he faced was the internal cultural resistance to doing things differently. In fact, he affirms that “once you overcome [the cultural aspect], there is no other challenge.” Even though the manner of making decisions about investments is different, George says, “You are doing everything you do normally as a part of

business: You build stuff, you operate stuff, you maintain things, but you are bringing in new practices as a new way of doing the old thing.”

For George, a key element of changing the culture was to provide the staff with a vision of the future. In order to do so, his team visited leading practitioners in Seattle and Australia. “We established what the future should look like,” he says, “and then we built the process around it.”

Benchmarking was also a critical part of establishing the program effectively, and they continue to engage in this process to seek areas of improvement. Using the benchmarking program run by the Water Services Association of Australia, George reports that they compared the MSD “against the best practitioners around the globe, so we know where we stand, we know the best practitioner in every process, we know our gaps and what we need to work towards.”

Moving to a Risk-Based Asset Management Approach for Water

After his success at the MSD, George moved to the GCWW to help them also adopt an asset management approach. However, the challenges on this side were very different. Since the 1990s, the department had a time-based asset management approach in place, in which it would replace 30 miles of pipe every year, an activity that currently costs about \$40 million.

George reports that Cincinnati benefitted from this intensive approach, and its infrastructure system is in much better shape than many systems in comparable cities are. However, adopting a risk-based



MSD personnel engaged in sewer repairs

Photograph courtesy of the Metropolitan Sewer District of Greater Cincinnati

CONTINUED

Best Practices Drive a Strong Asset Management Program

CINCINNATI, OHIO

asset management approach offered the possibility to reexamine the expense of replacing 30 miles of pipe annually. This freed the GCWW to make other investments to improve the system, such as expanding service to new areas.

In fact, freeing this money for other investments is becoming increasingly critical to help George's team with the challenges they face. "We are looking into how we diversify our investment so that we can generate income or keep costs lower for our users," says George, "because the water side's biggest challenge is our declining water usage and water rate, which means you use more but they pay less."

Best Practices

Scott Maring, the assistant superintendent of wastewater treatment at MSD, describes some best practices that support the MSD's asset management program: business case evaluations incorporating triple bottom line analysis, reliability centered maintenance (RCM), establishing a level of service, and creating a maintenance strategy for new assets before start-up.

USE OF TRIPLE BOTTOM LINE ANALYSIS IN BUSINESS CASE EVALUATIONS

Maring explains that the business case evaluations include "looking at the net present value of different alternatives for a project and, for each of those alternatives, [using] a social and environmental scoring tool that helps us rank the relative social and environmental benefit compared to each alternative." This may lead them to choose an alternative that is not immediately the

least expensive because of its benefits to their community. The scoring tool was developed internally, and it is being constantly improved as they consider the needs of the end user.

RCM

When the data reveal areas that cost a lot of money or where there are very low reliability issues with assets, they will assemble a team to create an RCM, the output of which, according to Maring, is a set of operations and maintenance strategies, as well as determining the critical spare parts that they need to have on hand to ensure high reliability. Maring explains that RCM is an advanced practice because it is very resource-intensive. It is unlikely to be adopted by a utility with a reactive maintenance culture because of its short-term focus.

LEVEL OF SERVICE

Maring acknowledges that most utilities struggle with establishing a level of service, but he finds creating a level of service is an important way to focus the efforts of his team and to help them prioritize projects, even with stringent levels like zero overflows and complaints.

HAVING A MAINTENANCE STRATEGY BEFORE START-UP

Meeting the consent-decree requirements forced MSD to bring many new assets on line and to remove many others. This volume of work creates significant challenges for the operations side of the business.

Because of the effort involved in tagging assets and creating good job plans, preventative maintenance plans and operations manuals, Maring describes how his group created a process to streamline that work, which begins with

Utility Profile

Lines of Business

Water and Wastewater

Population Served

Water: 1,200,000

Wastewater: 800,000

Annual Budget

Total Water: \$147,899,120

Total Wastewater: \$214,000,000

■ Water O&M: \$86,675,480

■ Wastewater O&M: \$115,000,000

5-Year Capital Improvement Plan

Water: \$284,308,000

Wastewater: \$976,000,000

Annual Projected Rate

Increases for the Next 5 Years

■ 2013: Water 7.25%; Wastewater 7%

■ 2014: Water and Wastewater 7%

■ 2015: Water and Wastewater 7%

■ 2016: Water 6%; Wastewater 7%

Asset Management Program

Launched

■ First Water Initiative: 1990

■ Second Water Initiative: 2011

■ Wastewater: 2007

updating their design standards to get information into the databases, and providing their staff or consultants with time to train the operations staff. Maring says, "What's in the field matches our databases, which matches the sheet of paper that crafts person is going to receive from day one." He explains that these efforts avoid gaps in critical maintenance right from the initial use of the new asset. ■

Benefits of Asset Management

Utilities that adopt a broader range of asset management practices experience more benefits. For all but one of the top seven benefits, a significantly greater percentage of practitioners with a high level of implementation experience the benefits than do those with a low level of implementation. (For more information on the spectrum of asset management implementation, see page 10.) Industry education on this finding can help encourage wider asset management implementation.

Top Three Benefits

While the top three benefits result from many asset management practices, all three rely on the availability of sound data on investments that comes with an advanced asset management practice.

IMPROVED ABILITY TO EXPLAIN AND DEFEND BUDGETS/INVESTMENTS

This benefit was reported by 80% of all asset management practitioners. Instead of budgets and investments based on past behavior, utilities with strong asset management practices evaluate investments using the data gathered on asset conditions, risk analyses, consideration of social and environmental impacts, consideration of impacts on service levels and business plans for larger investments. These tools help utilities to make better decisions, but they also provide clear, quantified data that can be shared with governing bodies and regulatory agencies.

BETTER FOCUS ON PRIORITIES

This benefit was reported by 67% of all asset management practitioners. One key element of asset management is the shift from a reactive managing approach to a proactive approach based on the needs of the utility and the population that it serves. A proactive approach allows priorities like customer-service levels, reliability, safety and environmental-impact mitigation to play a larger role in decisions about asset maintenance.

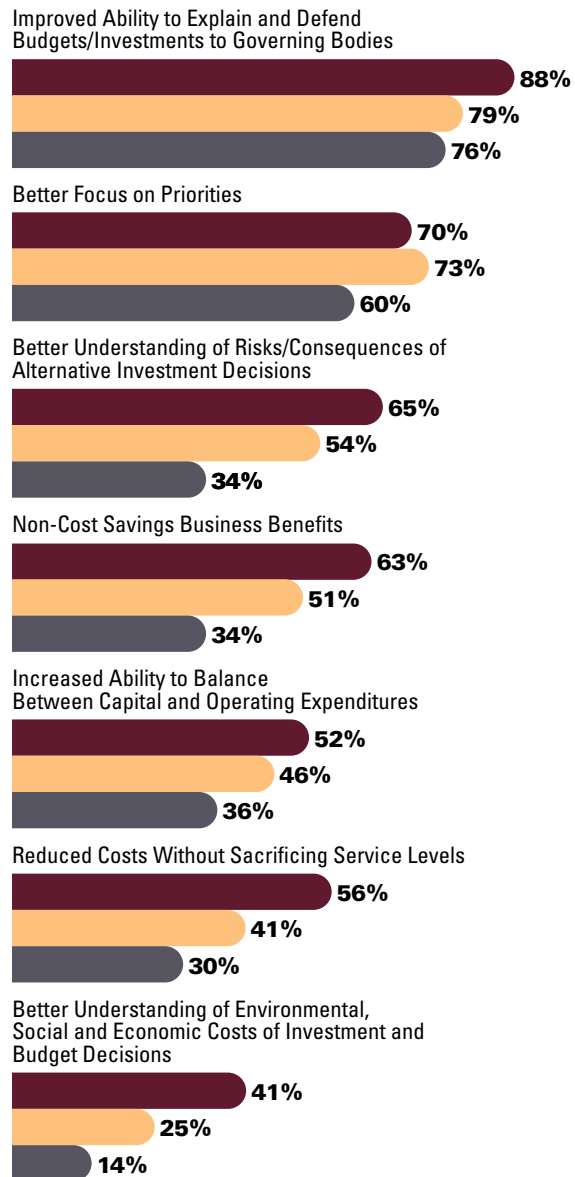
A better focus on priorities is the only top benefit without a statistically significant difference between those at the high end of the asset management utilization spectrum and those at the low end, which suggests that even at the early stages of asset management adoption, a few practices can promote a better examination of priorities.

Top Seven Benefits From Asset Management Approach

(According to Practitioners By Position on the Asset Management Spectrum of Use)

Source: McGraw-Hill Construction, 2013

- High Involvement
- Medium Involvement
- Low Involvement



BETTER UNDERSTANDING OF RISKS/ CONSEQUENCES OF ALTERNATIVE INVESTMENT DECISIONS

This benefit was reported by 49% of all asset management practitioners. While nearly 20% fewer report this benefit than the focus on priorities, there is only a 5% drop among those at the highest level of practices, which demonstrates that this benefit dramatically increases with a more holistic asset management approach.

One notable finding is that this benefit is experienced by a higher percentage of those with planned annual service-rate changes of 10% or more in the next five years versus those with smaller rate changes planned, especially among utilities offering water services only.

Cost Savings and Non-Cost Savings Business Benefits

On the low end of the asset management spectrum of use, there is only a difference of four percentage points between those who experience non-cost savings business benefits (34%) and those who report reduced costs without sacrificing service levels (30%). However, for those on the high end of the spectrum, that difference nearly doubles to 7 percentage points, with 63% reporting non-cost savings business benefits compared to 56% who report reduced costs.

While it is important to clarify that this result does not demonstrate that cost savings are less important than other benefits to high-level practitioners (see below for the impact of the ability to save costs without sacrificing service levels compared to the other benefits), it does reveal that a wider use of asset management practices improves a utility's ability to do business beyond just cost savings, including improved risk mitigation, service levels and regulatory compliance.

Other Benefits

For utilities at the low end of the asset management spectrum, the ability to balance between capital and operating expenditures is the third most-achieved benefit, with 36% reporting it. Even though a higher percentage of those at the high end of the asset management spectrum report experiencing this benefit (52%), it ranks sixth in this group of seven. This suggests that balancing capital and operating expenditures may be a good goal for utilities in the initial stages of building an asset management program in search of "early wins" that demonstrate its value.

On the other hand, it is far more likely for advanced asset management practitioners to have a better

understanding of environmental, social and economic costs of alternative investments and budget options than even those in the middle of the spectrum. This advanced practice is challenging to adopt, but it is notable that it is experienced by 41% of those at the high level of the spectrum.

Benefits With the Greatest Positive Impact

When asked to select the single benefit that provides them with the greatest positive impact, the respondents' top two choices mirror the benefits most frequently achieved.

- **Improved Ability to Explain and Defend Budgets/
Investments to Governing Bodies: 33%**
- **Better Focus on Priorities: 23%**

However, the only other benefit selected by more than 10% of all the asset management practitioners as the most beneficial is reduced costs without sacrificing service levels, selected by 15%. This benefit is particularly important to those at the high end of the asset management spectrum, selected by 21%, even more than those who choose a better focus on priorities (19%). Thus, even though advanced asset management practitioners find strong benefits beyond cost savings, they also recognize the importance of achieving those savings.

Variation by Size of Utility

A better understanding of the risks and consequences of alternative investment decisions is a benefit more frequently experienced by large utilities than by small ones; 70% of those serving a population of over 500,000 report this benefit, compared to 39% of those utilities serving 50,000 or less. The same pattern holds true when comparing utilities by revenue or by number of employees.

Variation by Years of Experience With Asset Management

A higher percentage of utilities that have had asset management programs in place for five years or more find that they have an improved ability to explain and defend their budgets (87%) and to balance capital and operating expenses (53%), than do those who have been practicing asset management for four years or less. Eighty-three percent of those who have had an asset management program in place for 10 or more years find that they have a better focus on priorities than utilities with less than 10 years' experience (65%).

Metrics Used to Track Asset Management Program Performance

Nearly all the asset management practitioners (93%) report tracking at least some metrics to measure the performance of their programs. Experience with asset management is also associated with a greater likelihood of tracking metrics, with only 2% of those doing asset management for five years or more reporting that they do not use any of the metrics in the survey, compared to 10% of those who have had an asset management program for less than five years.

Top Two Metrics in Use

The top two metrics allow utilities to understand the performances of their asset management programs through the performances of their assets and their costs. Both can be categorized as reactive measures tracking what has happened rather than proactive measures anticipating what may happen.

ASSET FAILURE METRICS

Seventy-four percent use metrics on the failure of assets, such as sewer backups and water main breaks, to determine the performances of their asset management programs. Asset failures are the most visible signs of utility performance for stakeholders, which may contribute to the popularity of this metric. Another factor that may impact its broad adoption is that utilities that have adopted an asset management approach in order to meet the requirements of a consent decree may need to report a reduction in the level of asset failures to meet the decree requirements.

Those with a medium or high involvement in asset management are more widely employing this metric than those with a low level of involvement.

- High Involvement in Asset Management: 82%
- Medium Involvement: 85%
- Low Involvement: 62%

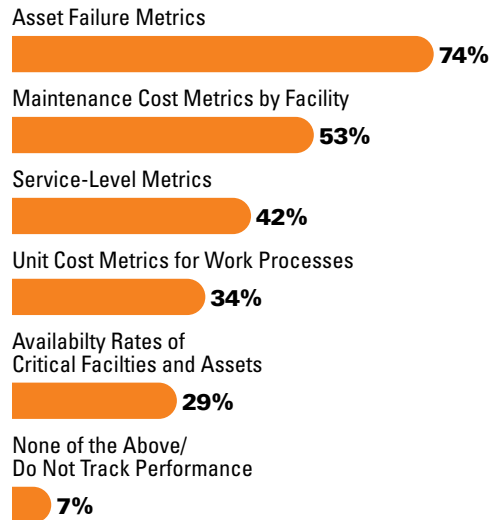
MAINTENANCE COST METRICS BY FACILITY

Understanding how maintenance costs vary by facility can be one way for a utility to determine best practices to be adopted more broadly, and therefore this is another key metric for those just launching their asset management programs. Thus, it is not surprising that, as with asset failure metrics, there is a statistically significant difference only between those with a low level of adoption and the rest.

- High Involvement in Asset Management: 61%
- Medium Involvement: 58%
- Low Involvement: 46%

Use of Asset Management Program Performance Metrics (According to Practitioners)

Source: McGraw-Hill Construction, 2013



Other Metrics in Wide Use by Highly Involved Asset Management Practitioners

Service-level metrics, such as the percentage of customers with deficient water pressure or the response time to emergency calls, are the next most-common metric, though largely due to the high use of these metrics by utilities on the high end of the asset management implementation spectrum. **In fact, 62% of highly involved asset management practitioners report use of service-level metrics, even more than the use of maintenance cost metrics by facility,** while only 38% of practitioners with medium involvement and 31% with low involvement report using this metric.

A similar pattern of use is also evident for the next most-popular metric. **Unit cost metrics for common work processes, such as the cost of installing a new water service tap or the cost to use CCTV to monitor a segment of sewer pipe, are adopted by 47% of highly involved asset management practitioners, over 15% more than those with medium or low involvement.**

These two metrics both involve a more proactive approach that is more typical of advanced asset management users, since they are focused on improving processes across the organization. These metrics can also be more challenging to gather and to establish targets around. Therefore, it is not surprising to find a strong gap in the adoption by those doing a wide range of asset management practices compared to the rest.

Top Most Useful Metrics

Respondents who reported using specific metrics were asked to rank the usefulness of the metrics in providing needed feedback, from poor to excellent.

The ranking by percentage of those that find the metrics useful largely correspond to their ranking by level of use.

- **Asset Failure Metrics: 83%**
- **Maintenance Cost Metrics by Facility: 79%**
- **Service-Level Metrics: 74%**
- **Unit Cost Metrics: 68%**

In addition, a significantly higher percentage of highly involved asset management practitioners report finding all of these to be very useful metrics, compared to those at the medium or low level of involvement.

The only exception to the ranking of the metrics by usefulness compared to the ranking by use is the metric of availability rates of critical facilities and assets. **Although its adoption level is relatively low at only 29%, among those who have adopted it, 79% find availability rates to be a very useful metric for giving them feedback on their asset management programs,** the same percentage who consider maintenance cost metrics by facility to be valuable, even though maintenance cost metrics are more widely used. **Even more striking is the percentage of highly involved asset management practitioners (90%) selecting this metric as very useful.**

These high ratings may be due to the ability of this data to help a utility to manage risk more effectively and to determine better operational and maintenance strategies.

Variation by Size of Utility

Two metrics are reported by a significantly higher percentage of larger utilities, whether measured by size of population served, revenue or number of employees.

- **Service-Level Metrics: 63% of utilities serving a population of over 500,000 reporting using this metric.**
- **Availability Rates of Critical Facilities and Assets: 48% of utilities with a revenue of \$100 million or more report using this metric.**

The Benefits of a Comprehensive Approach to Asset Management

The Department of Public Utilities

COLUMBUS, OHIO



O'Shaughnessy Dam

The city of Columbus first considered an asset management approach in its wastewater business in order to meet two consent orders it had with the Ohio Environmental Protection Agency in the early 2000s, but after seeing the results it was able to achieve, the city decided to launch a comprehensive program in 2008 across its water division as well.

Encouraging Adoption

One of the first strategies employed by the Department of Public Utilities (DPU) was demonstrating the impact of taking an asset management approach for pilot projects, even if those projects were only a small part of the overall work. For example, DPU was able to demonstrate that, in order to avoid some of the overflows that the consent order required it to address, there were other effective solutions besides large capital improvements to increase capacity. In one case, their team created a

program that significantly reduced the incidence of illegal dumping of fats, oils and grease. Another site-specific solution that they pursued was to proactively clean out sewers that had frequent debris issues and recurrent overflows. These early successes helped demonstrate that the DPU could reduce the frequency and volume of overflows while reducing the overall budget as well.

While the utility did face some internal resistance when embarking on these programs initially, Kevin Campanella, DPU assistant director, finds that “the beauty of an asset management approach is that it is just difficult to argue with. It’s a very logical, data-driven approach,” which helped the DPU to overcome staff reluctance.

When the DPU adopted asset management on the water side of their business, it followed the same approach of demonstrating the value of an asset management approach with pilot projects. Campanella

points out that one of the challenges was that the water business “did not have the driver—the regulatory mandate—from the consent order, so the driver was simply the credibility of the asset management approach. We needed to prove the worth of the program again.”

Because the utility had a rapidly increasing break rate on water mains, Campanella and his team chose to focus on developing a plan for replacing the mains that would stabilize the break rate. Before they took an asset management approach, Campanella reports spending about \$5 million a year to replace the worst performing pipe, but that approach fell far short of what was needed. He describes how the utility employed asset management principles to create a better strategy: “We looked at the water pipes in 30 different asset classes based on three things: their material, the era in which they were installed and the pipe thickness... By doing that, we were able

Benefits of a Comprehensive Approach to Asset Management

COLUMBUS, OHIO

WATER INFRASTRUCTURE ASSET MANAGEMENT: ADOPTING BEST PRACTICES TO ENABLE BETTER INVESTMENTS

to target which assets needed to be replaced quickly." Campanella reports that this effort was successful, not only because it allowed them to achieve their technical goal, but "it also helped the staff [by] giving them really clear direction and making their lives a little bit easier."

Full-Time Staff

One factor that Campanella reports as critical to taking a comprehensive approach was having a dedicated staff for just asset management. Campanella believes that "it placed a lot of focus on the initiative and [sent] a message to the rest of the utility that this is serious." He also finds that a dedicated staff is able to think more long-term because they are removed from day-to-day operations, which

allows them to be more innovative in their approach to problems.

Best Practices

One practice that Campanella finds to be an essential and highly successful component of their asset management approach is the use of business cases. The results achieved are outlined in the table below.

Campanella describes the process as follows: "We've identified many more alternative solutions than we have in the past by forcefully taking the time to step back, clearly define the problem and then brainstorm different solutions." A key part of these business cases, in addition to monetizing risk, is their ability to monetize social and environmental impacts. "We quantify what it costs

for a person to be without water or without power, or how much the value of an overflow [is] or the value of [avoiding] a backup into a basement," Campanella says. This, combined with risk analysis, provides them with strong benefits.

On the maintenance side, Campanella credits the DPU's shift from "a reactionary-based maintenance program to a much more proactive program," not only with providing strong financial savings (see below), but with creating a safer work environment: "Injuries are about seven times more likely when you're doing reactionary maintenance—when you don't have time to plan, when you are working quickly—as opposed to [doing proactive maintenance]." ■

Utility Profile

Line of Business

Water

Population Served

1,100,000

Annual Budget

Total: \$530 million

- O&M: \$250 million for wastewater and \$125 million for water)

5-Year Capital Improvement Plan

\$930 million for wastewater and \$620 million for water

Annual Projected Rate Increases for the Next 5 Years

5% for wastewater and 4% for water

Asset Management Program Launched 2008

Financial Benefits

Business Case Evaluation

Total Benefits: \$50,000,000

Total Costs: \$1,314,000

- Consultant Cost: \$725,000
- Approximate Staff Cost for Training and Administration: \$289,000
- Approximate Staff Cost for BCE Performance: \$300,000

Operations Optimization at 3 Water and 2 Wastewater Treatment Plants Total Lifecycle Benefits: \$13,100,000

- Consultant cost and DPU staff cost: \$600,000
- Approximate annual savings identified at water plants: \$250,000
- Estimated annual savings identified at wastewater plants: \$550,000

Maintenance Initiative Total Lifecycle Benefits: \$5,900,000

- Consultant cost and DPU staff cost: \$1,250,000
- Approximate annual savings (RCM): \$260,000
- Approximate annual savings (Other): \$100,000

stats

Triple Bottom Line Analysis

Puts Decision Making in Context

As awareness of water as a critical and finite resource grows, water management utilities are increasingly turning to triple bottom line analysis in both asset acquisition and operations and maintenance decisions.

When a concrete drainage culvert outside Seattle needed replacing, conventional asset management might have selected the least-cost solution. But Seattle Public Utilities (SPU) is committed to triple bottom line (TBL) analysis in its asset management. By that measure, the social and environmental implications of the culvert solution counted too: The culvert drained a lake with high recreational value, the drainage water was actually a salmon-bearing creek, and the failing culvert was located over a large drinking-water transmission pipe. So SPU generated seven options, ran a value-modeling process with experts and stakeholders together, and optimized the balance of the priorities at stake. The inclusion of the social and environmental impacts along with the financial cost in its final investment decisions reflects SPU's incorporation of TBL into its business cases.

"Conventional analysis really doesn't cover all of the benefits, or even all of the costs," says Terry Martin, acting asset management division director at SPU. "Triple bottom line paints a fuller picture of whether a particular project is a viable project or not." However, incorporation of TBL into business-case evaluations is still an emerging practice, even among advanced asset management practitioners.

Benefits of TBL Analysis

Not only can TBL analysis help utilities make investment decisions

that better balance the priorities at stake—making cities more livable, increasing the resilience of ecosystems, mitigating or adapting to climate change and realizing efficiencies of water and energy together—but utilities that actively manage and report TBL performance can also achieve significant organizational benefits as well.

According to a 2007 study for the American Water Works Research Foundation (AWWRF) (now the Water Research Foundation), organizational benefits can include helping political and regulatory agencies understand the challenges of water management; improving financial performance, risk management, credit ratings and fund-sourcing options; and facilitating communications with and among a wide set of stakeholders.

Challenges to Adoption

This increase in transparency poses the challenge that many utilities transitioning to TBL analysis fear most, especially when a utility is taking blame for sewer overflows in areas of flooding or striking an unpopular balance between conservation and water supply in areas of drought.

However, utilities that build trust through honest communication of good-faith efforts can transform the context in which they do business and create new possibilities for efficient asset management. The water utility of Sydney, Australia, has increased transparency through incremental change, initially

reporting on social and environmental priorities separately as a manageable step toward integrated TBL analysis and reporting.

The additional complexity in data collection and management required for TBL analysis poses a challenge that utilities operating on conventional accounting principles may not be equipped to manage. Martin attributes SPU's facility with TBL analysis to having economists on staff. "If there's a problem, engineers go straight to [asking] what's the pump or pipe that's going to solve it," says Martin, speaking as an engineer. "Economists focus on [asking] what's the right business decision." At SPU, that entails building a project-by-project business case, which assigns surrogate values to social and environmental factors whenever possible, highlights qualitative aspects that defy quantification but warrant consideration nonetheless, and takes lifecycle costs into account.

Starting Strategies

Initial steps may involve looking at what other utilities have done, holding internal workshops, and developing a reporting mechanism that focuses on what the utility's goals are. "Start small and build from there," says Carol Howe, a coauthor of the AWWRF study. "Success in TBL sometimes requires looking beyond the traditional boundary of the utility to work in closer partnership with customers and the community." ■

Data: Making Decisions on Asset Investments

Strategies for Funding Asset Repairs, Maintenance, Renewal and Replacement

WATER INFRASTRUCTURE ASSET MANAGEMENT: ADOPTING BEST PRACTICES TO ENABLE BETTER INVESTMENTS DATA

When asked to select their top three strategies for allocating funds for asset repair, maintenance, renewal and replacement, more asset management practitioners select strategies that build upon direct data and analyses of the assets themselves, while more non-practitioners choose strategies involving previous performances and behaviors.

While asset condition assessments are the most common strategy selected by respondents, a significantly higher percentage of asset management practitioners select this choice than non-practitioners do. With significantly more asset management practitioners reporting that they have a formal asset-condition assessment program for renewal and replacement planning than non-practitioners do (72% versus 20%; see page 11), it is not surprising that practitioners are able to rely on asset condition assessments for allocating funds. It is also clear that many non-practitioners do believe that they have some assessment of asset conditions even without a formal assessment program.

In addition to asset condition assessments, over half of the practitioners use asset performance data and asset management plans to determine their investments in existing assets.

- **Asset Performance Data: Engaging in a high level of asset management activities would make it more likely that the data on asset performance would be readily available.**
- **Asset Management Plans: Not only are these used by more than double the percentage of practitioners than non-practitioners, but they are also a top strategy for 68% of high-level practitioners, demonstrating that a more holistic approach allows greater use of this strategy.**

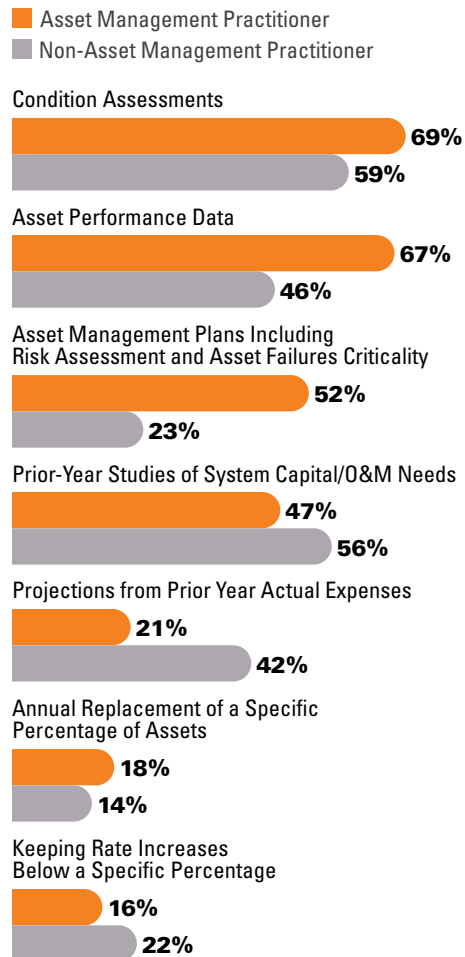
The second highest percentage of non-practitioners (56%) report using prior-year studies of system-capital and operations and maintenance needs. In addition, double the percentage of non-practitioners than practitioners report using projections from the prior year's actual expenses. Projections of prior year's actual expenses are also more widely used by city/municipal utilities than by regional ones.

Variation by Size of Utility

The one strategy consistently used by a significantly higher percentage of large utilities, whether measured by size of population served, revenue or number of employees, is the use of asset management plans.

Top Strategies for Allocating Funds for Repair, Maintenance and Replacement of Existing Assets

Source: McGraw-Hill Construction, 2013



- **Population: Used by 52% of utilities serving a population of over 500,000, compared to 33% of those serving a population of 50,000 and under**
- **Number of Employees: Used by 51% of utilities employing 100 or more employees, compared to 33% of those with less than 100**
- **Revenue: Used by 58% of utilities with revenue of \$100 million or more, compared to 32% of those with revenue of \$10 million or less**

Top Methods for Determining Investments in New Assets

When asked to select their top three methods for determining their investments in new assets, the highest percentages of both asset management practitioners and non-practitioners choose meeting government regulations and/or legal compliance. However, a significantly higher percentage of non-practitioners find compliance to be one of their top methods.

With the passage of strict environmental requirements from the 1970s and on, water and wastewater utilities, especially those in older communities, have had to make new investments to meet their legal obligations. The in-depth interviews with advanced asset management practitioners reveal that some utilities first adopt an asset management approach to meet these requirements.

The difference in the methods for determining new investments for second highest percentages of practitioners and non-practitioners is quite telling. For practitioners, assessment of the risks and consequences of critical asset failures is a top method for 57%, compared to just 38% of non-practitioners. In addition, the more engaged the respondents are with asset management, the more likely they are to select this measure, with 68% of those highly involved considering this an important means of determining their new asset investments. Incorporating risk into decisions about investment is a core principle of a holistic asset management approach.

On the other hand, the second most-important factor impacting investments in new assets for non-practitioners is the obsolescence of existing infrastructure. While this is an important factor for practitioners as well, the much higher percentage of non-practitioners suggests that asset management practices may help extend the life of existing facilities, reducing the impact of this factor.

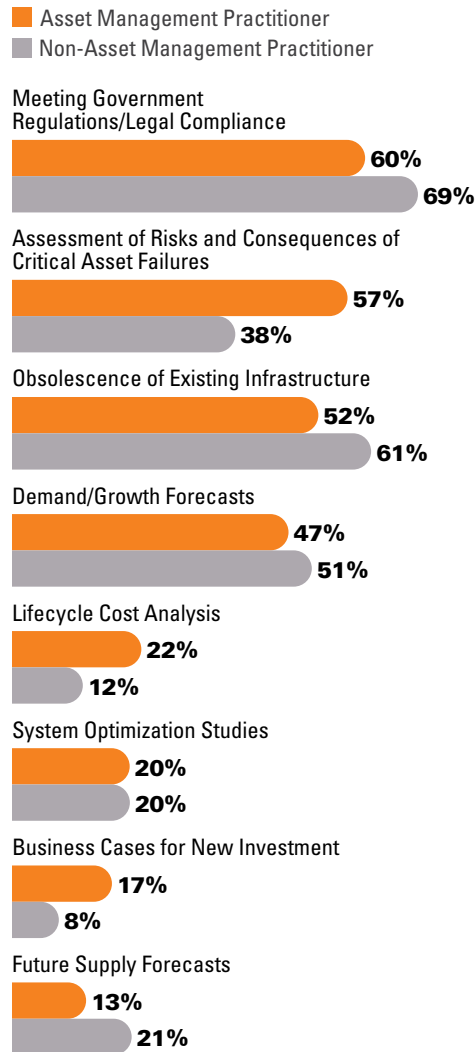
One factor in which high involvement in asset management practices has a significant impact on the importance of these approaches is the use of business cases for new investments. Not only are practitioners more likely to consider them a top method than non-practitioners, but 26% of highly involved asset management practitioners use business cases for determining their new capital investments.

Variation by Size of Utility

Business cases are selected more frequently as a top method by large utilities than by smaller ones, including those serving very large populations, with very large revenues, and with more than 250 employees. Most likely

Top Strategies for Determining Need to Invest in New Assets

Source: McGraw-Hill Construction, 2013



this is due to the additional resources available to larger firms to spend on developing these case.

Importance of Risk Assessment in Investment Decisions about New or Existing Assets

Eighty-four percent of asset management practitioners consider risk assessment an important part of how they make decisions about investing in new or existing assets, compared to 58% of non-practitioners. Not only are over one third of the non-practitioners neutral about the role of risk in their decisions, but 7% even consider risk unimportant.

This finding clearly demonstrates the way in which adopting asset management practices leads to a corresponding prioritization of risk analysis. In fact, many of the key asset management practices—including consideration the impact of alternative investments, creation of business cases, consideration of environmental and social costs and benefits, optimization of the balance between operations and maintenance and capital improvement investments and reliability-centered maintenance—all involve some degree of risk assessment. (See pages 11 to 13 for more information on the use of these practices.)

In addition, **while there is a notable increase in those who consider risk important from the low (81%) to the high (89%) end of the asset management spectrum of use, this difference is not statistically significant,** demonstrating that even a relatively low engagement with asset management practices leads a utility to increase the role of risk assessment in its approach.

The increased attention to risk in the process of making investment decisions is a clear benefit of adopting an asset management approach. It enables current savings, such as avoiding costly regular maintenance on low-risk assets, while also encouraging future savings by helping to minimize the possibility of an expensive loss of functionality through more strategic planning of new assets and through maintenance of existing ones.

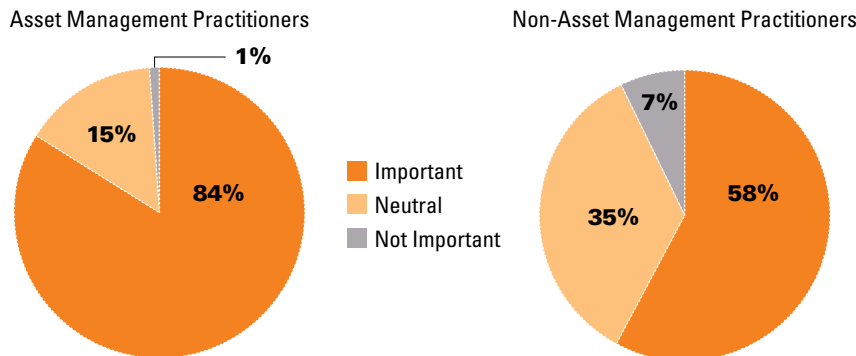
Variation by Level of Projected Capital Improvement Spending

In both the water and wastewater sectors, the percentages of respondents who consider risk assessment an important part of their investment decisions are significantly higher among those expecting to spend \$5 million or more in the next five years than those projecting less spending.

- **Water Sector**
 - Spending \$5 million or more: 83%
 - Less than \$5 million: 61%
- **Wastewater Sector**
 - Spending \$5 million or more: 87%
 - Less than \$5 million: 66%

Importance of Risk Assessment in Decisions About Investments in New or Existing Assets

Source: McGraw-Hill Construction, 2013



WATER INFRASTRUCTURE ASSET MANAGEMENT: ADOPTING BEST PRACTICES TO ENABLE BETTER INVESTMENTS DATA

WATER INFRASTRUCTURE ASSET MANAGEMENT: ADOPTING BEST PRACTICES TO ENABLE BETTER INVESTMENTS DATA

Planning Horizons for Asset Strategy Planning

Fifty-nine percent of asset management practitioners have a planning horizon of 10 years or more, compared to 33% of non-practitioners, and almost one quarter of practitioners consider possible impacts more than 20 years in the future as part of their planning process. On average, practitioners have a 15.6-year horizon and non-practitioners have a 10.8-year horizon.

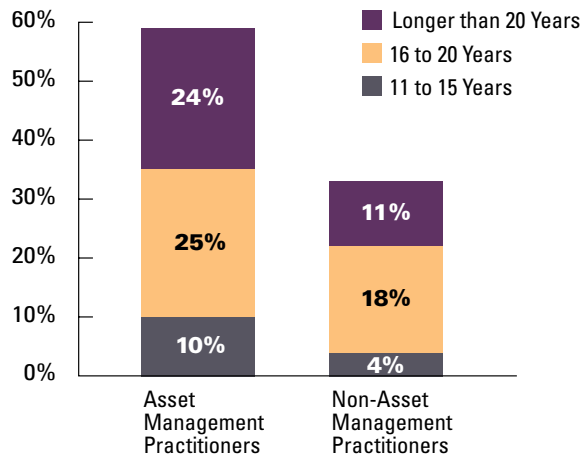
Asset management practitioners typically have access to more data on assets and their conditions than non-practitioners, which can improve their ability to conduct long-term planning. Also, an important aspect of asset management involves consideration of the full lifecycle of assets and of strategies that can appropriately extend the lives of those assets, which can demand a longer planning horizon.

This is another demonstrated benefit of having an asset management program. Organizations with longer planning horizons can be more proactive and create better strategies for finding funding for needed work.

Furthest Planning Horizons for Asset Strategy Planning

(According to Respondents Planning More Than 10 Years Out)

Source: McGraw-Hill Construction, 2013



Projected Rate Increases Over the Next Five Years

A larger percentage of asset management practitioners report expecting water rate increases of 5% or more than non-practitioners, but in wastewater, the difference is only nominal, with a slightly larger percentage of non-practitioners expecting increases at this level.

Water Rate Increases Projected at 5% or More

- Asset Management Practitioners: 53%
- Non-Asset Management Practitioners: 45%

Wastewater Rate Increases Projected at 5% or More

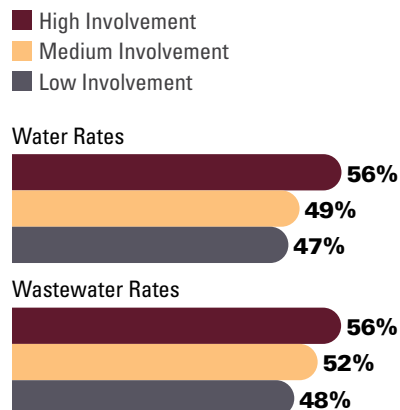
- Asset Management Practitioners: 49%
- Non-Asset Management Practitioners: 51%

Among practitioners, a trend toward higher rates also emerges at the high end of the asset management spectrum of use. One likely cause for this trend is that utilities with a high level of asset management practices are more familiar with the long-term needs of their assets and stakeholders, and so they can better defend the need for rate increases with clear, quantifiable data. (See page 18 for more information.)

Percentage of Utilities Projecting Rate Increases of 5% or More in Five Years

(According to Practitioners by Position on the Asset Management Spectrum of Use)

Source: McGraw-Hill Construction, 2013



WATER INFRASTRUCTURE ASSET MANAGEMENT: ADOPTING BEST PRACTICES TO ENABLE BETTER INVESTMENTS DATA

Funding Sources for New Assets and Improvements to Existing Assets

Funding for New Assets

A significantly higher percentage of asset management practitioners fund their new assets through bonds and accumulated reserves than do non-practitioners.

- **Bonds:** Bonds need to be approved by voters or government agencies outside of a utility, and the ability to better explain and defend the need for new assets with quantifiable data may help asset management practitioners get more bonding initiatives passed. (See page 18 for more information.)
- **Accumulated Reserves:** This finding may support the cost savings experienced by many practicing asset management, possibly making more money available in the accumulated reserves due to smarter management.

It is also worth noting that a higher percentage of asset management practitioners report accessing the majority of these assets than do non-practitioners. Even though these differences are not statistically significant, when considered as a whole, the data do suggest a general trend toward practitioners being able to obtain a broader range of funding for their work than non-practitioners.

While current revenues are the most common means of funding new assets for both practitioners and non-practitioners, 90% of highly involved practitioners report using this source for new assets. Again, better business management and prioritization may help free funds in existing revenues for investment in new assets for those putting many of the practices to use.

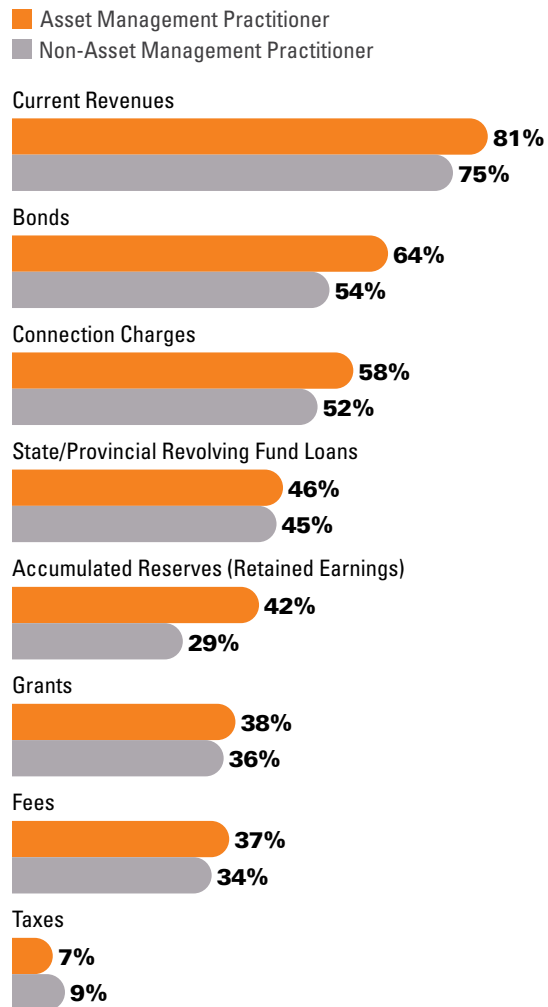
The following are more common sources of funding for utilities with both water and wastewater services, compared to those that just supply drinking water: connection charges, revolving funds, grants and fees.

Funding for Improvements to Existing Assets

Practitioners and non-practitioners are more aligned in the ways they fund improvements to existing assets than they are in how they fund new assets. Current rate revenues are used by 95% of asset management practitioners and 92% of non-practitioners to fund the improvements to their existing assets. The only other major source of funding noted in the survey are fees—for example, connection fees—with roughly the same percentages, 32% of practitioners and 31% of non-practitioners, reporting use of fees to fund their work on existing assets.

Funding Sources for New Asset Investments

Source: McGraw-Hill Construction, 2013



Taking a Service-Level Approach to Implementing Asset Management

City of Regina

REGINA, SASKATCHEWAN, CANADA

WATER INFRASTRUCTURE ASSET MANAGEMENT: ADOPTING BEST PRACTICES TO ENABLE BETTER INVESTMENTS

The city of Regina's approach to asset management is centered around customer service levels and experience. This has allowed their staff to prioritize their approach and work toward their short-term and long-term performance objectives.

Making the Decision to Adopt an Asset Management Approach

The main factor that initially led them to consider implementing an asset management approach was the consistent nine percent rate increases that had been required for the last six years. According to Stella Madsen, Director of WaterWorks Services, "While the city council recognized ... that utility rate increases were necessary in that time in 2010 for the three-year period, it was also acknowledged—and not just by the city council but by our administration—that nine percent increases may be unsustainable over the long term."

Madsen explains that they chose to implement an asset management approach, not only to help them ensure the "sustainability of our services and infrastructure in the future" but also because they wanted to "help our customers better understand the challenges we face as a utility and the plan we have in moving forward." Madsen's team committed to two things at that point: that the next rate review for 2014 to 2017 would be performance-based and that they would begin to implement a program of best asset management practices.

While still at the early stages of this implementation, the utility is already beginning to see benefits, and they largely attribute these benefits to the serviceability approach that was adopted.

Using a Serviceability Approach

Making the decision to adopt a serviceability perspective helped them determine how to prioritize their adoption of asset management practices. Loretta Gette, Senior Engineer with Water and Sewer Engineering, explains that the serviceability perspective defines the required outcomes in terms of the level of service provided to customers rather than focusing primarily on managing the assets themselves. She says, "It is not just a bunch of assets that provide the service; it is the people in the organization [and] the way we manage those assets operationally, as well as collectively, that provides for the services the customers receive." And according to Gette, getting the entire organization to adopt this mindset has been an

ongoing challenge that they have had to face in order to implement their program.

Madsen explains why her team decided to make a serviceability approach the heart of their asset management program: "Evidence in the United Kingdom has shown that taking a serviceability approach leads to more strategic solutions. You optimize your system better, and you get more cost-effective operational and capital solutions. It is not just about capital investments into the infrastructure; it's about looking at what are the best solutions for the entire system."

Implementing Asset Management

Madsen and Gette dealt with the change management issues right from the beginning by engaging all levels of their organization in a self-assessment that helped determine how to prioritize their efforts. That self-assessment was then employed to create a vision of what the organization wanted to accomplish. According to Madsen, "We involved our managers, supervisors and engineers in a process to do a self-assessment. And then we said, 'What do we want to be like?'" This final element was critical because it allowed them to formulate a clear plan for the short term and the long term that was built from the feedback of their staff and that therefore encouraged the staff to buy-in to the final vision. Madsen describes how they "set out performance objectives for one, three, five and 10 years...that helped us establish our priorities."

However, Madsen also emphasizes the importance of getting the leadership engaged in the process.

Utility Profile

Lines of Business

Water, Wastewater, Stormwater

Population Served

207,429

Annual Budget

Total: \$100,077,000

■ O&M: \$61,047,000

5-Year Capital Improvement Plan

\$398,644,000

Annual Projected Rate

Increases for the Next 5 Years

Still to be determined

Asset Management Program Launched

2010

stats

CONTINUED

Taking a Service-Level Approach to Implementing Asset Management REGINA, SASKATCHEWAN, CANADA

“Getting executive buy-in was also important, and we brought information on a regular basis to our executives.”

Initial Benefits

While both Madsen and Gette acknowledge that they are still in a relatively early stage in their implementation, important benefits are emerging from their approach.

From the start, they had realized that they needed to define what kind of service the customer receives. As part of that process, they have conducted customer focus groups, and these have been a valuable source of data on what services the customers believe that they receive and even how they prioritize them. Madsen states, “We’ve gathered four or five years of trending data on each one of those services, with actual measures.” They have found that being able to provide these data to their executives helps to provide much greater clarity about the decisions that have been made.

The executives are not the only stakeholders to whom they need to communicate. They have also found that the utility has been better able to engage the public to explore which services to

maintain, restore or improve and what the public is willing to pay for the service levels that they desire. Madsen states, “Our strategic focus within the organization is to define and address the gap between the services we provide and our ability to pay for them, and our customers’ willingness to pay for those things.” The serviceability approach has already seen benefits in terms of the ability to communicate with stakeholders and set priorities based on that communication. According to Madsen, “Our experience has been [that when we provide] more information to our customers so that they understand the services, the cost and the options...they are much more supportive when our rates do need to be increased.”

Gette explains that a key element of this improved communication with customers is creating level of service definitions that are meaningful to customers. As an example, she explains that one level of service for water is that it meets or exceeds provincial water quality standards and objectives. She finds that meeting regulations is terminology that customers understand, unlike more technical issues, like chlorine levels.

Although the early stage of implementation has not yet allowed them to document many specific cost savings, the utility is beginning to see the benefits of taking a proactive approach to operations and maintenance. For example, it has engaged in a more aggressive approach of relining underground infrastructure in order to extend their life. Madsen reports that, based on “initial estimates coming from the work we had done at the start, it can cost 10 times as much to replace our underground sewer pipes as to reline them.”

These early wins have helped Madsen and Gette to expand their asset management program. Because of the results of earlier investments, their leadership has allowed them to develop a condition assessment program. Madsen says, “We never had that before until we started to demonstrate some of the cost savings that could occur.”

Looking Forward

Madsen explains that they are currently developing “technical levels of services that support the customer levels of service. We are going to be able to measure how our infrastructure is doing, how our operational programs [are doing] and how they drive and impact the levels of service that the customer actually feels, so that we can tie our day-to-day activities to those things.” ■



North Pumping Station

Taking Risk Management to the Next Level Through Asset Management

Expanded data collection and better analysis of existing assets has improved the ability of utilities to predict future failures and to prioritize capital improvements.

Through the evolution of water and wastewater asset management, utilities are leveraging ways to greatly refine how they assess risk. Chris Crockett, the deputy commissioner for planning and environmental services at the Philadelphia Water Department, says that new asset management systems are taking risk management to a new level: “We finally feel that the technologies are coming together for us to manage our assets in a way that allows us to take into account risk management.”

Crockett, along with a department research team, started taking steps toward an asset management system in 2007. “At that time, when you talked about pipe replacement, people would ask, ‘How much pipe should you replace?’” he recalls. “What we realized is that we’re not asking the right question. The question should be ‘Are we replacing the right pipe at the right place at the right time?’ That’s what creates value for customers. When you look at it from that perspective, you then look to tools to show you what the probability of a pipe failure is, what the risk factors associated with it are, and what are the consequences associated with that failing.”

Crockett says that the basic concepts of risk assessment—looking at the risks and consequences of failure—remain largely the same, but that his team can consider more factors with greater detail under its new system. In addition to detailed inventories of its pipes and sewer

lines, the department can pull in Geographic Information Systems (GIS) information and hydraulic models. GIS allow for the storage, viewing and analysis of geographic data, such as maps. “In looking at risk factors, we used to have lots of intangibles,” Crockett says. “Now it’s very detailed. Everything is mapped with GIS, so we can map which pipes are at more or less risk.”

Previously, Crockett says the department’s pipe-replacement efforts were focused on the age of a pipe and the number of breaks experienced by the same type of pipe elsewhere in the system. Now the department often considers 10 or more factors. “We did a good job before, but we didn’t have enough granularity of the risk factors to take this to the next level,” Crockett adds.

Regulatory Risks

Such improvements in risk assessment are evolving as the industry experiences new and expanded risks. Many municipalities face increased regulatory risks that weigh heavily into their capital improvement planning. Due to regulatory requirements, the city of Baltimore has directed much of its funding for water and wastewater to fulfilling mandates, says Rudolph Chow, the head of the city’s Bureau of Water & Wastewater.

To help mitigate funding gaps, Chow created a new utility asset management division to focus more on preventive maintenance. Chow says that the department’s work in

asset management plays an important role in how the department addresses its regulatory risks. “In taking a risk management approach, we can more accurately project the useful life of our assets and do a better job planning our capital improvement program as a whole,” he says.

Although mandates are primarily focused on the wastewater side, Chow says that the city is working with the U.S. Environmental Protection Agency (EPA) to take a more holistic approach. “All of these costs are borne by the same ratepayer,” he says. “In order to do a true integrated planning framework, we must include [drinking] water as well.”

Disaster Risks

Meanwhile, many municipalities are also factoring in the risk of natural or man-made disasters. Kevin Morley, the security and preparedness program manager at the American Water Works Association, notes that while concerns over terrorism were at the forefront following the September 11, 2001, terrorist attacks, the industry has moved to an all-hazards approach when looking at resiliency. As such, Morley says that many municipalities are using a utility resilience index to help assess risks and prioritize projects.

“Utilities realize you can’t do everything,” Morley says. “They understand that you need to go through a process of assessing risk and focusing on those efforts that bring you the highest net return.” ■

Data: Drivers and Barriers

WATER INFRASTRUCTURE ASSET MANAGEMENT: ADOPTING BEST PRACTICES TO ENABLE BETTER INVESTMENTS DATA

Organizational Issues Influencing the Decision to Adopt an Asset Management Approach

For asset management practitioners, reputation, organizational attitude toward risk and financial pressure were all important influences in the decision to initiate asset management at their utilities. Roughly three-quarters of practitioners report that each of these had a positive influence on their decisions. This result demonstrates that those who invest in these practices are driven by factors that extend beyond financial pressures, including the desire to minimize risk and to enhance their reputations.

Concerns about reputation and risk management are also considered to have a positive influence by a large percentage of non-practitioners in the consideration of whether to adopt asset management, although a significantly higher percentage of non-practitioners think that reputation and perceptions of performance may have a negative influence than practitioners do. Asset management can involve greater data gathering and transparency, and while a negligible percentage of those using asset management report any negative influence from these factors, those less involved may have concerns about this aspect of engaging in asset management.

On the other hand, non-practitioners are notably more concerned about the negative impact of fiscal/financial pressures on their abilities to adopt a holistic asset management approach. Despite the financial savings noted by asset management practitioners (see page 18), adoption of an asset management approach is clearly perceived to involve financial risks. The advanced-practitioner participants in the in-depth interviews make it clear that most of the asset management practices involve intensive change management efforts in order to be successful, and these efforts do require devoted staff, which could be perceived to have financial implications. However, most of those advanced practitioners also note significant positive financial impact due to asset management adoption, similar to the practitioners in the survey, despite these investments.

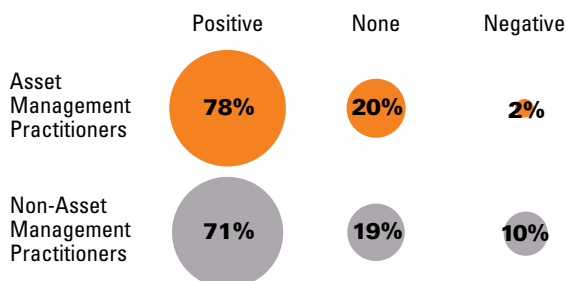
Variation by Size of Utility

Eighty percent of those serving a population of more than 50,000 find that reputation is a positive influence compared to 68% in smaller utilities.

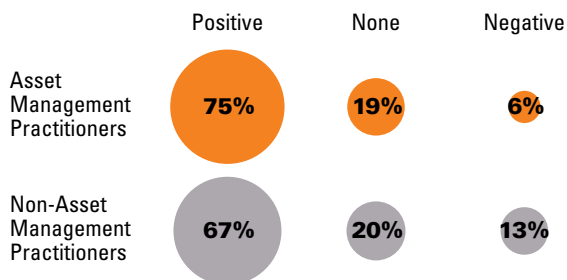
Influence of Organizational Issues on Decisions to Adopt Asset Management

Source: McGraw-Hill Construction, 2013

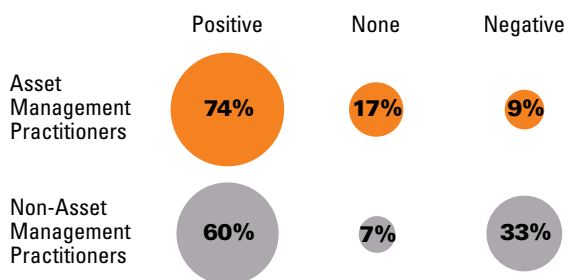
Influence of Reputation/Perception of Performance



Organizational Attitude Toward Risk



Financial/Fiscal Pressure



WATER INFRASTRUCTURE ASSET MANAGEMENT: ADOPTING BEST PRACTICES TO ENABLE BETTER INVESTMENTS DATA

Top Drivers for Implementing Asset Management at Respondents' Utilities

Two drivers for implementing asset management hold strong sway with asset management practitioners and non-practitioners alike.

- **The highest percentage of practitioners (75%) select the ability to determine capital investments and maintenance strategies and budgets, and 71% of non-practitioners agree.**
- **The highest percentage of non-practitioners (74%) find the need to expand, replace or upgrade infrastructure a top driver, and 72% of practitioners agree.**

Both of these are fundamental to the practice of asset management, and it is not surprising that practitioners and non-practitioners both recognize their importance.

However, the importance of several of the remaining drivers is significantly different between practitioners and non-practitioners.

The need for a framework to better manage the risk of asset failures is selected by a much higher percentage of practitioners. This result, in combination with the importance of risk assessment to practitioners (see page 27), demonstrates that consideration of risk and consequences is a clear differentiator between the utilities that have adopted asset management and those that have not. In addition, the finding that there is no statistically significant difference in the positive influence of an organization's attitude toward risk in the decision to adopt asset management between practitioners and non-practitioners (see page 33) suggests that risk becomes more important to practitioners because of their use of asset management practices, rather than just a organizational emphasis on risk management leading to an asset management approach.

A significantly higher percentage of non-practitioners are influenced by public/regulatory pressures and the documented positive experience from other organizations than are practitioners. The greater importance of public/regulatory pressures to non-practitioners suggests that they may need more external motivation than the current practitioners to adopt asset management. Their greater interest in the documented experiences of others may suggest that some non-practitioners are also skeptical about asset management, a conclusion supported by the previous finding of their concerns for the negative influence of fiscal pressures (see page 33).

It is notable that the lines of business in which the utilities engage make no difference in terms of the importance of any of these drivers.

Top Drivers for Asset Management Implementation at Respondents' Utilities

Source: McGraw-Hill Construction, 2013



WATER INFRASTRUCTURE ASSET MANAGEMENT: ADOPTING BEST PRACTICES TO ENABLE BETTER INVESTMENTS DATA

Primary Driver for Implementing Asset Management in the Water Utility Market

When asked to select the single most-important driver for implementation of asset management in the water utility market, the respondents gave answers that correspond with their answers about their own utilities. **For all respondents, the top two reasons remain the need to replace, upgrade and/or expand existing infrastructure and the ability to determine capital investments and maintenance strategies and budget.**

Similar to how they responded to what would drive their own utilities to adopt, asset management practitioners and non-practitioners do vary in terms of how many think that the remaining reasons are primary drivers for asset management in the industry. A significantly higher percentage of practitioners find a framework for managing risk the most significant reason, while more non-practitioners find regulatory pressure and anticipation of high rate increases to be more significant.

Most Important Driver for Asset Management Adoption in the Water Infrastructure Industry

Source: McGraw-Hill Construction, 2013

- Asset Management Practitioners
- Non-Asset Management Practitioners

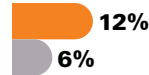
Significant Need to Replace, Upgrade and/or Expand Infrastructure



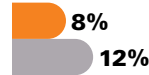
Ability to Determine Capital Investments and Maintenance Strategies and Budgets



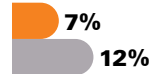
Need for a Framework to Better Manage Asset Failure Risks and Consequences



Public/Regulatory Pressure to Address Environmental, Safety, Service or Poor Maintenance Issues



Anticipation of High Rate Increases



WATER INFRASTRUCTURE ASSET MANAGEMENT: ADOPTING BEST PRACTICES TO ENABLE BETTER INVESTMENTS DATA

Top Triggers for Asset Management Implementation

For asset management practitioners and non-practitioners alike, concerns about the physical assets for which they are responsible are more important triggers than factors related to financial savings, regulations, customers or their workforces. Thus, aging infrastructure is selected by about three-quarters of all respondents as one of the top three most-important factors that led to or would lead them to use of an asset management approach, with increasing system reliability and understanding the risks and consequences of asset failures selected by 39% and 36% of all respondents, respectively.

In addition, there is a slight trend, although with no statistically significant differences, for more practitioners than non-practitioners to consider these factors among the top three triggers that led them to implement asset management at their organizations. Even though practitioners note that important benefits extend beyond physical asset improvements (see page 18), the decision to adopt asset management is still motivated most heavily by concerns about the assets.

A significantly higher percentage of non-practitioners consider potential financial savings and mounting rate pressure and public scrutiny important as a trigger that could lead them to implement asset management. While some practitioners do report financial savings as a benefit of asset management and most find that practicing asset management allows them to better communicate the need for their investments to their stakeholders, it is important to note that less than a quarter of practitioners select these factors as among the top three triggers.

Variation by Level of Government

Aging infrastructure is a bigger trigger for the implementation of asset management for respondents from city/municipal utilities (78%), compared to those at the county/regional level (63%). It is possible that many cities are still relying on infrastructure installed a century ago or more, making them more vulnerable to failures.

On the other hand, **more county/regional utilities find that increasing system reliability (49%) and capturing the knowledge of their aging workforces (37%) are important triggers than do those in cities (38% and 23%, respectively).** Certainly, with a system more likely spread over a larger geographical area, it is not surprising that county/regional utilities find system reliability to be a stronger impetus than those in a municipality find.

Top Triggers for Asset Management Implementation

Source: McGraw-Hill Construction, 2013



WATER INFRASTRUCTURE ASSET MANAGEMENT: ADOPTING BEST PRACTICES TO ENABLE BETTER INVESTMENTS DATA

It is also possible that finding experienced employees is more challenging in a non-urban environment, making knowledge transfer even more important.

Variation by Utility Size

VARIATION BY REVENUE

Fifty-three percent of respondents from utilities with revenues of \$100 million or more select the need to better understand the risks and consequences of asset failures as an important trigger, compared to 33% of those with revenues under \$100 million. For the other measures of utility size, such as population served and number of employees, there are no equivalent differences. This may suggest that utilities with high revenues may be more sensitive to service disruptions to high-paying customers.

VARIATION BY POPULATION SERVED

Thirty-two percent of respondents from utilities serving populations of over 500,000 find mounting rate pressure and public scrutiny an important trigger, compared to 16% of those serving populations of 500,000 and under. There may be a range of reasons contributing to the increased importance of this trigger, including greater concern about public outcry and concern about the impact of rate increases on vulnerable populations.

Glossary of Terms

Computerized Maintenance Management System (CMMS)

According to the U.S. Department of Energy, a computerized maintenance management system is "a type of management software that perform functions in support of operations and maintenance (O&M) programs. The software automates most of the logistical functions performed by O&M staff." For more information, go to www.eere.energy.gov/femp/program/om_cmms.html.

Consent Decree

According to USLegal.com, a consent decree is "a voluntary agreement worked out between two or more parties to a dispute. It generally has the same effect as a court order and can be enforced by the court if anyone does not comply with the orders.... The use of a consent decree allows the licensing agency and the parties involved to resolve a disciplinary proceeding initiated by the agency without the time and expense required by a formal administrative hearing." For more, go to definitions.uslegal.com/c/consent-decree.

Reliability-Centered Maintenance

A process that gathers data on how an asset functions, how it fails, why it fails and the consequences of its failure; it then creates proactive maintenance and operational strategies based on the data.

Revolving Fund Loans

A means of financing new projects by using the payment of principle and interest from previous loans to fund new loans, usually targeted at encouraging investment with a high rate of return.

Strategic Asset Management Plans (SAMPs)

According to the Water Environment Research Foundation's 2009 *Compendium of Best Practices in Water Infrastructure Asset Management*, a SAMP is a short-term planning document that guides the management of a category of assets to meet defined objectives.

Ways to Encourage Greater Adoption of Asset Management by Water Utilities

The strong level of agreement in the responses to an open-ended question about encouraging greater adoption of asset management in the industry demonstrates that there are a few key actions that would help promote greater use of asset management.

More Information and Education

Twenty-four percent of respondents stated that having proof of the costs and benefits of asset management would be important to encourage wider asset management implementation, and 22% regard more education within individual programs as critical. Clearly, for asset management practitioners and non-practitioners alike, having access to more information about asset management and providing more information to all levels of their organizations about what it entails is necessary to encourage adoption. The importance of education about asset management was also raised by all the participants in the in-depth interviews with advanced asset management practitioners. Therefore, access to more educational resources, like case studies of the benefits gained from advanced asset management practitioners, is essential.

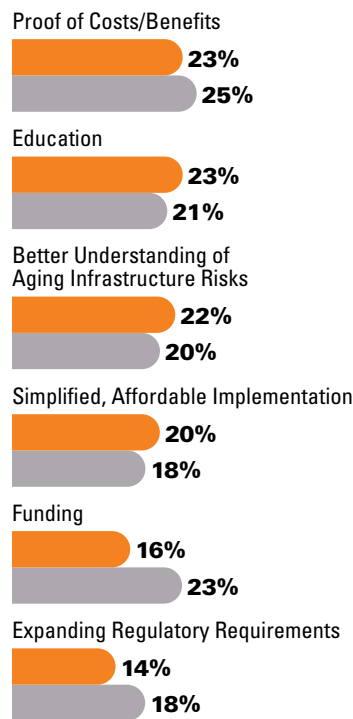
One participant of the in-depth interviews also stated that information on the benefits of asset management have to be calibrated to the specific interests of the engineers who run the utilities. Simply pointing out cost savings will not be as compelling as evidence that demonstrates how asset management will allow them to do their jobs more effectively.

Twenty-one percent of all respondents also believe that a better understanding of the risks of aging infrastructure and the consequences of asset failures would encourage wider adoption in the industry. Since adoption of some basic asset management practices helps utilities to better understand these risks and consequences for their specific assets, this finding demonstrates that adoption of some practices can help utilities see the value of adopting additional practices, a conclusion supported by the expected level of increases in adoption of many of the practices by 2017. (See pages 11 to 13.)

Ways to Encourage Greater Adoption of Asset Management (Most Common Open-Ended Responses)*

Source: McGraw-Hill Construction, 2013

■ Asset Management Practitioners
■ Non-Asset Management Practitioners



External Factors Encouraging Adoption

A large percentage of non-practitioners suggest that external factors, like funding and regulatory requirements, are important to encourage adoption. While the differences between the percentages of practitioners and non-practitioners who find these external factors important are not statistically significant, when combined together they do suggest that external factors may be more critical to get non-practitioners to consider adopting more asset management practices consistent with other findings in the study.

However, the need for external factors encouraging adoption is also noted by several of the in-depth interview participants. Most note that, in general, utilities are more likely to rely on what they have always done rather than invest in improving their processes. One interviewee states, “Most utilities are enterprise funds, and even in hard economic times, enterprise funds tend to get what they need. As long as you can get what you need without having a lot of questions, there’s no need to improve.”

The in-depth interview participants also note that other countries have external pressures encouraging the use of asset management practices. In Australia, the use of financial regulators for the industry forces their utilities to demonstrate the value of capital and operational investments. In Europe, the use of privately owned utilities places greater value and emphasis on reliability than in the United States, and, thus, is another factor that encourages asset management adoption.

Variation by Utility Size

Thirty-three percent of utilities with 250 or more employees mention the importance of education and changing the culture of their organizations, compared to 18% of those with less than 100 employees and 21% of those with between 100 and 249 employees. To achieve the full benefits of an asset management approach, everyone at all levels in the utility must understand and actively adopt the approach. The more employees that need to be involved, the greater the possibility for pockets of resistance. In-depth interview participants also mention that everyone in the utility needs to see that this approach is permanent and pervasive, and some remark that constant communication is necessary to reinforce the importance of asset management with their staffs.

Variation by Region

Thirty-one percent of respondents in the East recommend expanding regulatory requirements to encourage adoption, compared to 13% or less from the other three regions.

Influence of Stakeholders on the Decision to Adopt Asset Management

Asset management practitioners are generally quite positive about the influence of stakeholders. In fact, over 90% of practitioners note that all the stakeholders have either a positive or a neutral influence on the adoption of asset management.

The largest percentage of practitioners indicate that their internal staffs have a positive influence in the decision to adopt asset management. For non-practitioners, regulators are selected by the largest percentage. This corresponds to the previous findings about the factors that impact the adoption of asset management, with practitioners impacted most by internal factors (like the need to deal with their aging assets, reliability and understanding the risks of asset failures), while non-practitioners put greater emphasis on external influences. (See page 36 for more information.)

Non-practitioners, though, do recognize the importance of internal staff in the adoption as well. **Not only do 74% of non-practitioners find that they have a positive influence, but 17% also find that they have a negative influence, compared to just 5% of practitioners.** This finding is supported by the in-depth interviews with advanced asset management practitioners, who note that change management encouraging acceptance of an asset management approach is critical to successfully implementing an asset management program.

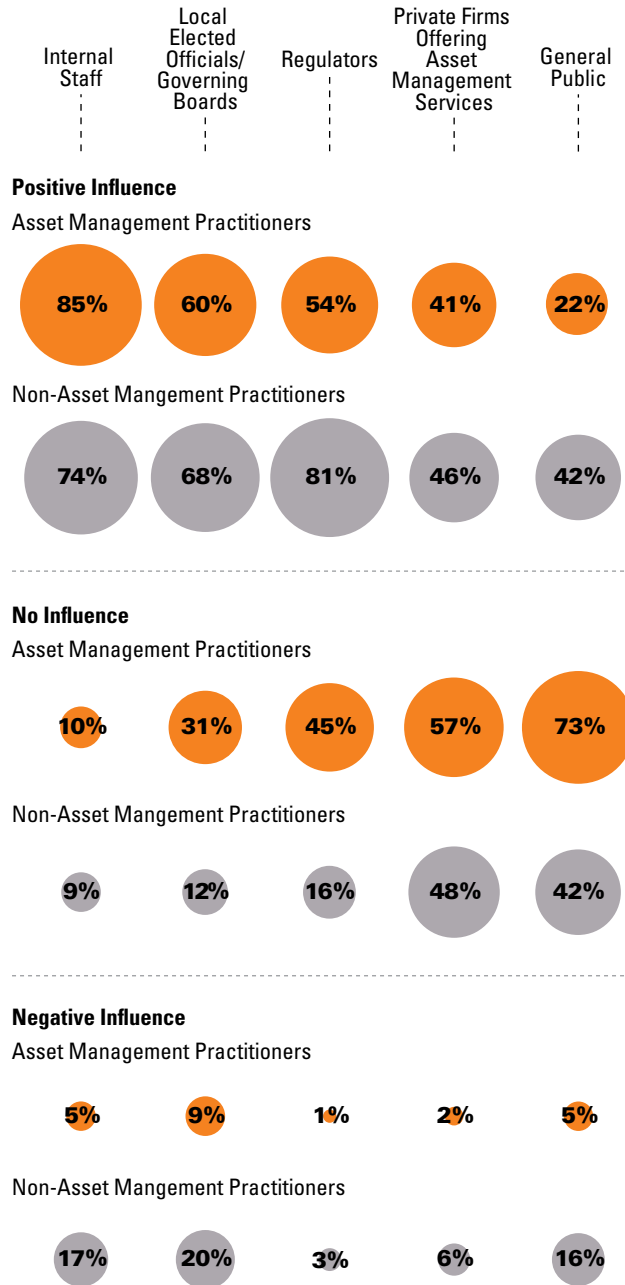
Regulators are also considered more positively influential by smaller utilities—71% of those with an annual revenue of less than \$10 million and 72% of those serving a population of 50,000 or less indicate that regulators have a positive influence.

For non-practitioners, local elected officials and governing boards and the general public are noted to have a negative influence by a significant percentage. This finding suggests that creating more general awareness of the benefits of asset management among these stakeholders could have a positive impact on greater adoption.

Local elected officials and governing boards are also considered to have a positive influence on asset management adoption by both practitioners and non-practitioners. This finding corresponds to one of the key benefits of asset management—that it allows utilities to better explain their budgets and investments to officials and governing boards. (See page 18 for more information.)

Stakeholder Influence on the Decision to Adopt Asset Management

Source: McGraw-Hill Construction, 2013



Funding and Regulatory Challenges

For U.S. Water Infrastructure

Water and wastewater utilities face significant challenges in keeping up with capital improvement needs and regulatory demands—and these could become increasingly difficult to keep pace with in the coming years.

While public infrastructure as a whole is experiencing a funding gap, the divide between funds and needs is particularly pronounced in the water sector. Based on current trends, the funding gap for water and wastewater systems in the United States is expected to hit \$84 billion by 2020, according to the report *Failure To Act: The Impact of Current Infrastructure Investment on America's Economic Future*, released by the American Society of Civil Engineers (ASCE) in January 2013.

While the total dollar value of the funding gap will be larger in the surface-transportation sector by 2020 (\$846 billion), the investment gap as a percentage of needs is greater in the water and wastewater sector than other infrastructure sectors, according to the report. By 2020, only 33% of water and wastewater needs will be funded, compared to 47% for inland waterways and marine ports, 51% for surface transportation, 71% for airports and 85% for electricity.

If current funding trends continue, the ASCE predicts that the gap will continue to widen. By 2040, the ASCE estimates that water and wastewater needs in the U.S. will reach \$195 billion with expected funding of \$52 billion. With that gap of \$144 billion, only 27% of needs would be funded.

Cost of Regulations

Regulations are driving much of those costs. The U.S. Conference of Mayors (USCM) has highlighted

concerns over “unfunded mandates,” particularly around the Clean Water Act. They estimate that local governments spent more than \$109 billion in 2009 to meet clean-water goals, up from \$50 billion in 1995.

Consent decrees have been particularly onerous for many municipalities. The Metropolitan St. Louis Sewer District is under a decree of nearly \$5 billion to improve its sewer overflows. Other cities facing major upgrade demands under consent decrees include Chicago (\$3 billion), Washington, D.C. (\$3 billion) and Kansas City (\$2.5 billion).

The USCM notes that, while water districts face increasingly expensive mandates, the federal government provides less than \$2 billion per year to states, and that funding is in the form of loans, not grants.

In addition, water and wastewater funding is not immune from budget cuts. The 2011 Budget Control Act, which mandates budget sequestration cuts, called for a drop of \$293 million in U.S. Environmental Protection Agency (EPA) aid to state revolving funds for water projects.

“This is a crisis,” says Amanda Waters, the general counsel and director of public advocacy and outreach at the Water Environment Foundation. “There has not been an increase in investment, so every year that goes by, our infrastructure ages more.” Waters says that many local governments are spending so much of their budgets on water- and wastewater-related requirements

that they don’t have enough resources left over to upgrade systems and make them more resilient. Instead, they often address aging infrastructure only after it fails.

Future Outlook

However, Waters says that she sees signs of hope. The EPA is working with some water authorities to advance its Integrated Planning and Permitting Policy (IP3) initiative. Among its goals, IP3 aims to cut through regulatory red tape and to help agencies better prioritize implementation plans, bumping up critical projects and delaying those that would provide limited environmental benefits.

Waters also notes that public support for water infrastructure remains high and that elected officials are responding in kind. A 2010 survey by Xylem showed that 95% of Americans rate water issues as “extremely important.” The survey also found that 79% of voters believe that elected officials should make water issues a priority.

In 2012 both the Republican and Democratic national party platforms included language on water infrastructure investment and referenced the positive impact on job creation, economic growth and health, says Waters. “What’s in a party platform doesn’t necessarily transfer into policy, but this language wasn’t in the 2008 platforms,” she adds. “This says there’s a national commitment to water and we need to keep reminding Congress of that.” ■

WATER INFRASTRUCTURE ASSET MANAGEMENT: ADOPTING BEST PRACTICES TO ENABLE BETTER INVESTMENTS DATA

Top Barriers to Asset Management Adoption at Respondents' Utilities

While the highest percentages of asset management practitioners and non-practitioners select the same two factors—lack of internal staff capacity and complexity—as among their top barriers to asset management adoption, it is clear that non-practitioners consider these barriers particularly important. Each was selected by two-thirds of the non-practitioners, nearly 30 percentage points more than any other factors, and the percentage concerned about the complexity of adoption is significantly higher than it is for practitioners.

These concerns about staff capacity and complexity again suggest that education in the industry, both within organizations and more generally, about the basic methods of asset management would help to encourage adoption.

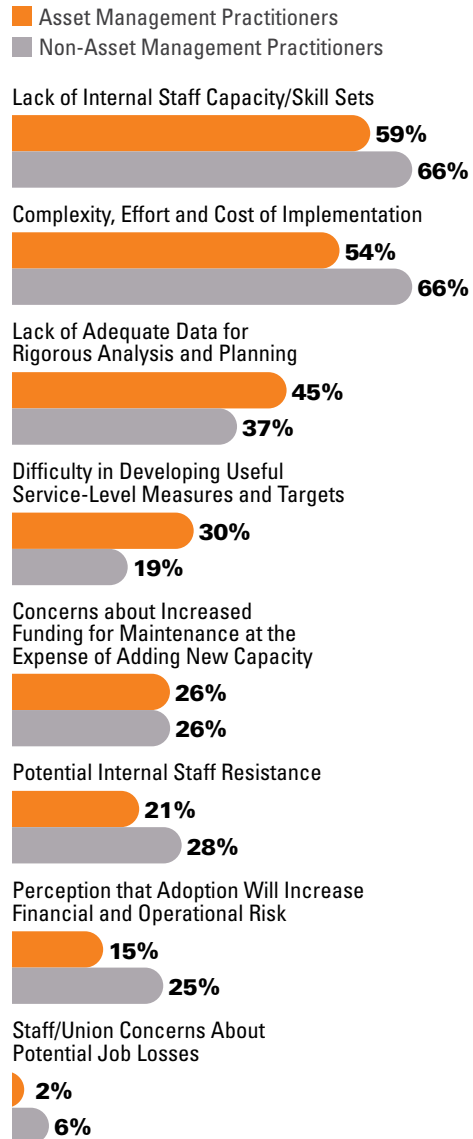
Interestingly the complexity of starting an asset management program is noted by a lower percentage of practitioners that have had a program in place for 10 years or more (40%), compared to practitioners with less experience. One possible reason for this is that early adopters may not have attempted ambitious asset management programs across departments or involving multiple practices because there were not as many U.S. examples driving what could be adopted. Several of the advanced asset management practitioners who participated in the in-depth interviews note the strategy of initially taking on small goals as key to launching an asset management program successfully.

Data and Service Level Targets
Concerns about data and appropriate service level targets are considered obstacles by a higher percentage of practitioners than non-practitioners, and the difference for appropriate service level targets is statistically significant.

This demonstrates the challenge of obtaining data and getting started, which was also reported by the advanced-practitioner participants in the in-depth interviews. In order to encourage broader adoption, more data and a more direct way to determine service levels will need to be pursued by the water infrastructure industry.

Top Barriers to Asset Management Adoption Faced by Respondents' Utilities

Source: McGraw-Hill Construction, 2013



Perception That Asset Management Increases Financial and Operational Risks

Another significant difference between practitioners and non-practitioners is the concern that adoption of asset management increases financial and operational risks faced by the organization, a concern of one quarter of non-practitioners but only 15% of practitioners.

Since an asset management approach is typically initiated to minimize these risks, it is possible that this reflects concerns among non-practitioners about the potential exposure of the risks that they face through the transparent analyses encouraged in the use of asset management practices. The same data that make it easier to justify budgets and investments (see page 18) may also expose potential weaknesses in an organization.

Variation by Utility Size

Internal staff resistance is a more important concern for larger utilities, whether their size is measured by population served, revenue or number of employees.

■ Population Served

- More than 50,000: 27%
- 50,000 or less: 18%

■ Revenue

- \$50 million and more: 32%
- Less than \$50 million: 16%

■ Number of Employees

- 250 employees or more: 33%
- Less than 250 employees: 20%

For larger organizations in particular, there may be many challenges that need to be overcome with the internal staff, including the desire to avoid change, resistance to giving up responsibilities and decisions traditionally held by one group to another, and less communication between departments and divisions. Many of these challenges were also reported by the in-depth interview participants at larger organizations when they launched their asset management programs.

On the other hand, smaller institutions are more concerned about the perception that asset management adoption will increase the financial and operational risks to their organizations. Again, this is true across all measures of size, including those serving a population of 50,000 or less (28%), those with annual revenues less than \$50 million (23%), and those with fewer than 100 employees (25%). Smaller organizations may have less room in their budgets to dedicate to the effort of adopting new practices and may be more vulnerable if their investments do not yield the cost benefits that they expect.

VARIATION BY POPULATION

For utilities serving populations of more than 50,000, the lack of adequate data to support rigorous analysis and planning is also noted by a larger percentage of respondents (46%) than those serving smaller populations (36%).

In contrast, more utilities serving a population of 50,000 and less (32%) are concerned that adopting asset management will lead to increased funding for maintenance at the expense of adding new capacity.

Top Barrier to Asset Management Adoption in the Water Infrastructure Industry

Thirty-six percent of asset management practitioners and non-practitioners agree that the most important barrier to asset management adoption in the water infrastructure industry is the complexity of asset management.

Certainly, the sum of the 14 practices can be daunting to firms not doing asset management, but one key to success is not trying to launch an entire program at once. When commenting on the challenges facing asset management adoption, one of the advanced practitioners from the in-depth interviews noted, “Part of the engineering mind-set is that you can’t design halfway.... But for a lot of asset management, you can take baby steps without it being perfect the first time. It’s an iterative process, and you improve each time.”

For practitioners, the second most-important barrier to asset management adoption in the industry is the perception that adoption will increase financial and operational risks. This finding is telling when compared to the concerns that they have for their individual utilities, where a far smaller percentage selected this as one of the top three barriers. (See page 43.) This disparity suggests that this concern is not as pervasive in the industry as many believe it to be.

Similar to the responses about the individual utilities, though, a higher percentage of small utilities, whether measured by size of population served, annual revenue or number of employees, find concerns about increasing financial and operational risks to be the most important barrier to adoption in the industry. This demonstrates the necessity of more education about the impact of asset management practices on financial and operational risks that is targeted to smaller utilities.

The remaining factors selected by at least 9% of the respondents as the most important barrier correspond with the top barriers for the individual utilities. This fact, along with the lack of any statistical differences between the asset management practitioners and the non-practitioners, suggests that these factors are the obstacles on which the industry needs to focus not only to encourage greater adoption of asset management approaches, but also to help organizations to increase their use of asset management practices. Commitment to training, as well as to streamlining and standardizing data collection, is important to help further industry adoption of asset management practices.

Most Important Barrier to Adoption of Asset Management in the Water Infrastructure Industry

Source: McGraw-Hill Construction, 2013

■ Asset Management Practitioners
■ Non-Asset Management Practitioners

Complexity, Effort and Cost of Implementation



Perception that Adoption Will Increase Financial and Operational Risk



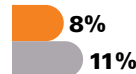
Lack of Internal Staff Capacity/Skill Sets



Lack of Adequate Data for Rigorous Analysis and Planning



Concerns about Increased Funding for Maintenance at the Expense of Adding New Capacity



External Obstacles to Asset Management Implementation

A larger percentage of non-practitioners expect to encounter external obstacles to implementing an asset management program than do the percentage of practitioners who report having faced those obstacles. In fact, 29% of practitioners report facing no external obstacles at all. This suggests that many of the biggest challenges that need to be overcome after deciding to implement asset management exist within an organization.

Over half of the non-practitioners are concerned with justifying the start-up costs and the time required to achieve benefits to governing bodies or regulators. Given the high percentage who selected this, it may not just reflect concerns about skepticism externally but also doubt about these issues among the respondents themselves. If this is the case, then more information in the industry about the experience of practitioners may help allay this concern.

Forty-four percent of non-practitioners also report being concerned about explaining the benefits to their governing body and the external demands for time and resources to address other crises. Clearly, more information about the benefits of asset management would help alleviate the first concern, but the second could also be addressed with greater knowledge about asset management programs. While fears about other demands for time and resources may be a concern in the short term, the ability of the utility to be less crisis-driven and more proactive is one of the benefits of asset management reported by several of the advanced practitioners in the in-depth interviews. One of the advanced practitioners stated specifically that he felt that asset management allowed him to enable his staff to focus on their current jobs, especially with managers, rather than dealing with crises.

Variation by Utility Size

Small utilities, when measured by the size of the population they serve or by their annual revenues, are concerned about three external obstacles.

- **Justifying the start-up costs and the time required to achieve benefits to governing body/regulators**
 - Population: 43% of those serving a population of 50,000 or less, compared to 34% of those serving more than 50,000
 - Revenue: 46% of those with revenues of less than \$10 million compared to 21% of those with revenues of \$100 million or more

External Obstacles to Asset Management Implementation

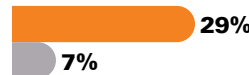
Source: McGraw-Hill Construction, 2013

- Asset Management Practitioners
- Non-Asset Management Practitioners

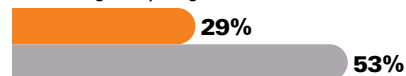
External Demands for Time/Resources to Address Other Crises



Did Not Face Significant Obstacles



Justifying Start-Up Costs and Time to Governing Body/Regulators



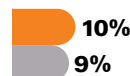
Explaining Benefits to Governing Body/Regulators



Absence of Local Asset Management Program Implementation Expertise



Don't Know



■ External demands for time and resources to address other immediate crises

- **Population:** 41% of those serving a population of 50,000 or less, compared to 31% of those serving more than 50,000
- **Revenue:** 43% of those with revenues of less than \$10 million compared to 29% of those with revenues of \$100 million or more

■ Explaining the benefits to governing bodies and regulators

- **Population:** 39% of those serving a population of 50,000 or less, compared to 31% of those serving more than 50,000
- **Revenue:** 46% of those with revenues of less than \$10 million compared to 24% of those with revenues of \$100 million or more

Creating Teams to Make Better Decisions

Portland Water Bureau

PORTLAND, OREGON

WATER INFRASTRUCTURE ASSET MANAGEMENT: ADOPTING BEST PRACTICES TO ENABLE BETTER INVESTMENTS

The Portland Water Bureau (PWB) has had an asset management program in place since 2005, but its focus on engaging the entire organization and building teams has the same importance now to its success as it did when the program was first launched.

Top-Down and Bottom-Up Approach

In 2005, the PWB team was inspired to implement an asset management approach by budget problems, but they wanted to do a better job in managing their assets, according to Michael Stuhr, chief engineer. Once the team decided to develop an asset management program, the senior leadership in the organization developed a charter. "This was one of the first documents that was signed by every group director in the bureau and the bureau administrator," states Stuhr, explaining that "it was impactful for the staff to see that the senior management was really behind [the program]."

The next critical step in the process was done from the bottom up. In addition to forming a small asset management team, Stuhr says, "We went to the worker bees in the organization and decided that, for this to really work, we had to educate and get buy-in from our folks who actually manipulate all these assets." The team quickly recognized the importance of the cultural change that had to engage all workers across the organization in order to be successful.

Stuhr emphasizes the importance of getting engagement across the organization for a successful program: "In some ways, the

most important thing we have done is carefully educat[ing] our staff to begin to think in this way. What's the business case for that project? What's the risk, and what's the consequence of various kinds of failures?"

Jeff Leighton, senior engineer, asset management, agrees with Stuhr about how critical it is to change the staff's mindset. For him, asset management "is not just about the data, not just about the systems. It is mostly about the business process.... Are you going to think about your investment decisions, these business cases? Are you going to look at liabilities instead of maintenance?" Everyone in the organization needs to think in these terms for the program to be successful.

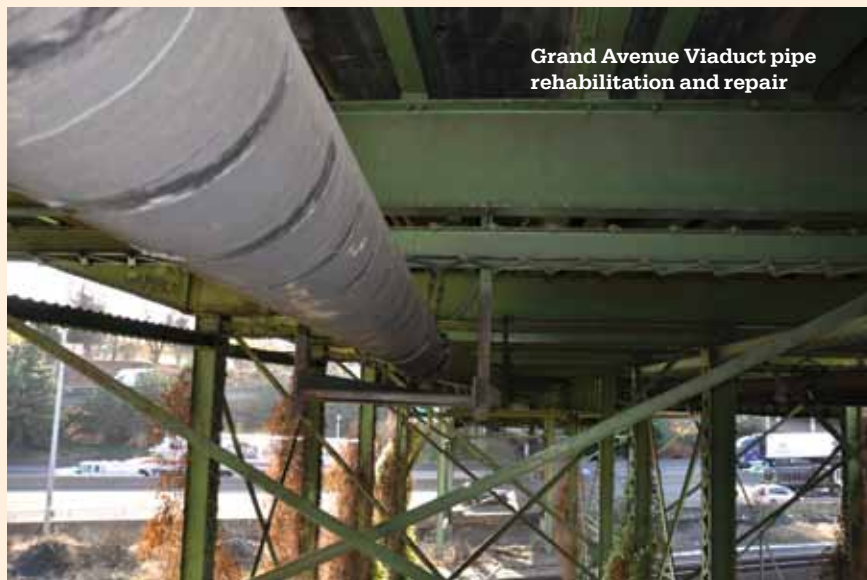
Leighton notes one small example of the PWB's success in encouraging acceptance of the program across the bureau: "We have an acronym for our risk approach. It's called CLEM, [which] stands for Consequence and Likelihood of failure Evaluation

Method. We've turned that acronym into a verb, and people will say 'Have you CLEM'ed that project?'" The broad adoption of this term across the organization is just one small example of how the ideas of asset management have become embedded in the work processes of its staff.

Team Building

Team building across departments was critical to the launch of the program, and it continues to be a fundamental tool that Stuhr and Leighton employ today. As Stuhr points out, "Very seldom in something as complicated as a water utility does any one person know everything you need to know to make a complex decision."

From the start, the process involved their small asset management team working with people from across their organization. Depending on the issue, teams could consist of staff from operations, engineering, construction, maintenance or finance. According to Stuhr, taking



Grand Avenue Viaduct pipe rehabilitation and repair

Creating Teams to Make Better Decisions PORTLAND, OREGON



Condition assessment of buried critical pipe at Interstate 405 and SW Taylor and Salmon streets

this approach offers “a tremendous opportunity to do team-building between [departments] that sometimes don’t get along. There’s always creative tension in any big maintenance-heavy organization between engineering and the field.”

Leighton reports that the first team was put together after the small asset management team identified an area on which to focus that offered strong potential for an early win: hydrant overhauls. He reveals that the evaluation determined that routine overhauls were not necessary, which allowed for significant cost savings.

This first team had to learn how to conduct business case evaluations and how to think about the challenges differently from how they had before. The efficiencies gained, despite the team’s steep learning curve, were enough to motivate the rest of the organization.

Best Practices

The PWB has had industry recognition of several of its practices, including the following:

STRATEGIC AND TACTICAL ASSET MANAGEMENT PLANS

The PWB has currently completed 20 out of 24 of these plans, in which

the assets are divided into classes, and the plans provide both immediate and long-term recommendations for maintaining the assets in these classes. As with the business cases, these were all developed by teams with members drawn from across the organization.

BUSINESS CASE TOOLS

In order to standardize the business case processes, their asset management group created a booklet on how to do a business case. Because of their emphasis on a team approach, the booklet is written specifically for engineers and field people.

Successes Achieved

While both Stuhr and Leighton see benefits from the adoption of an asset management approach that extend beyond cost savings, they can also provide specific, concrete examples of how the asset management approach has allowed their group to make better investment decisions.

- **Pump Station:** Their standard practice before adopting an asset management approach would have called for replacement of a pump station, with an estimated cost of \$6.5 million. After conducting a business case and risk assessment,

Utility Profile

Lines of Business

Water

Population Served

935,000 (566,000 retail)

Annual Budget

Total: \$216.5 Million

■ O&M: \$80.7 Million

5-Year Capital Improvement Plan

\$535 Million

Most Recent Rate Increase

7.6% (FY July 2012–June 2013)

Asset Management Program Launched

2005

stats

the asset management team determined that the problem was not the station as a whole but the electrical system. The final cost of the project was less than \$1 million.

- **Tank:** A proposed tank replacement underwent a similar business case evaluation and risk analysis. Instead of a new tank costing \$2 million, the bureau was able to provide connections to other pressure zones for less than \$300,000.
- **High-Risk Pipe:** Using a risk-based rather than standard approach, the bureau did an assessment of all the pipes at the bridge crossings of the two major interstates that run through Portland, which revealed a pipe expansion that was forcing the pipe to zigzag. Replacement of that pipe cost \$125,000. An interstate shutdown, on the other hand, would have an impact that Stuhr and Leighton estimate would cost in the tens of millions of dollars. ■

Data: Implementing Asset Management

WATER INFRASTRUCTURE ASSET MANAGEMENT: ADOPTING BEST PRACTICES TO ENABLE BETTER INVESTMENTS DATA

Self-Assessment of Asset Management Practice

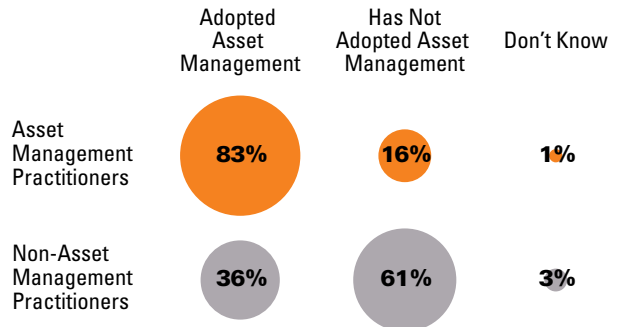
Asset management is a term that needs better definition in the water infrastructure industry.

When asked whether they have developed and implemented an asset management program in the last 20 years, almost all respondents are confident that they know the right answer. However, over one third (36%) of respondents from utilities that do three or fewer asset management practices believe that they have developed and implemented an asset management program, and 16% of those who are doing four practices or more believe that they have not implemented an asset management program. This includes 12% of those in the middle of the asset management spectrum of use, who engage in seven to nine practices.

These results clearly demonstrate that there is not a single, clear industry-wide definition of what it means to be an asset management practitioner, and that agreement on such a definition would help advance the adoption of more sophisticated asset management approaches.

Self-Assessment of Asset Management Adoption

Source: McGraw-Hill Construction, 2013



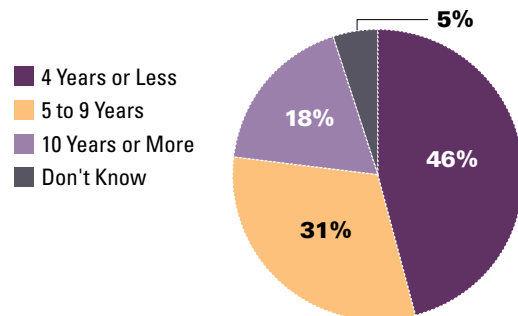
Number of Years Since Decision to Implement Asset Management

Use of asset management is still relatively new in the United States and Canada, with only 18% of current practitioners reporting that they made the decision to implement an asset management program more than 10 years ago. The highest percentage of practitioners (46%) have had a program in place for only four years or less. There are also no statistically significant differences in the percentages who have adopted for a short time or for a long time between respondents from the United States and Canada.

This result—combined with the high expectation of adoption of many of the practices, by practitioners and non-practitioners alike, over the next five years—suggests that asset management is still in the early stages of adoption in North America.

Number of Years Since Making Decision to Adopt Asset Management Approach (According to Practitioners)

Source: McGraw-Hill Construction, 2013



Profile of Organizations Implementing Asset Management

In many ways, asset management practitioners and non-practitioners have a similar profile. There are no statistically significant differences in terms of their distribution by country or geography, in the types of services that they provide, in whether they serve retail or wholesale customers, nor even in the ages of their assets.

However, two key differences should be considered in attempts to encourage wider adoption of asset management practices in the market.

Size of Firms

Utilities practicing asset management tend to be much larger than non-practitioners.

- **Serving a Population of More Than 50,000**

- Practitioners: 69%
- Non-Practitioners: 45%

- **Median Number of Employees**

- Practitioners: 122
- Non-Practitioners: 71

- **Median Value of 2011 Revenues for Retail Water Services**

- Practitioners: \$9 million among utilities offering only retail water services; \$23 million among utilities offering retail and wholesale
- Non-Practitioners: \$5 million among utilities offering only retail water services; \$9 million among utilities offering retail and wholesale

Larger utilities may be more able to invest money and staff attention into implementing practices than smaller utilities can. A few obstacles to implementing asset management resonate more with smaller utilities (see

pages 42 to 43), so addressing these will encourage wider adoption of practices among this group.

The survey results reveal that more practitioners from large utilities experience several key benefits, including a better focus on priorities, better understanding of risks and consequences of alternative investment decisions and non-cost saving business benefits. This is likely due to the trend of larger utilities adopting more practices, which increases the benefits achieved by practitioners. (See page 18 for more information.) However, there are no statistically significant differences between small and large utilities that achieved reduced costs without sacrificing service levels, suggesting that small utilities will see a return on their investments in asset management.

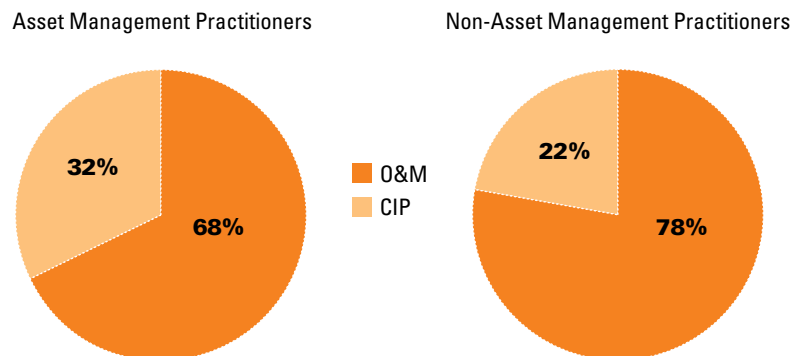
Division of Water Budgets

One concern for small utilities is that adopting asset management will lead to increased investment in operations and maintenance at the expense of capital planning. However, **practitioners devote more of their budgets to capital improvements: Capital improvement plans account for an average of 32% of the practitioners' budgets, compared to 22% of the non-practitioners' budgets.**

This result is not surprising because asset management allows operational investments to focus only on the areas where they are most needed to produce the required service levels and extend the lives of the assets. The advanced practitioners in the in-depth interviews support this conclusion, for they point out that their investments are made more effectively and less wastefully because of their adoption of asset management practices.

Average Proportion of Water Budgets for Operations and Maintenance (O&M) and Capital Improvement Plan (CIP)

Source: McGraw-Hill Construction, 2013



WATER INFRASTRUCTURE ASSET MANAGEMENT: ADOPTING BEST PRACTICES TO ENABLE BETTER INVESTMENTS DATA

Lessons for the U.S. Market

From Australia's Approach to Asset Management

Decades in the making, the Australian system represents the potential for asset management, risk assessment and triple bottom line business practices that some water and wastewater utilities hope to implement in the United States.

Among U.S. asset management advocates, Australia has been held up as a model of success. Still, more than a decade since U.S. utilities began to take serious strides toward modernized asset management, fundamental challenges remain to achieve the level of sophistication and penetration of the kind of asset management that is apparent in the Australian market.

Regulatory Drivers in the Australian Market

Twenty years ago, the impetus for change in Australia was spurred by financial regulations that demanded new business practices at water utilities. The Council of Australian Governments made major strides toward change in 1994 following the adoption of the Water Reform Framework, which included a push for utilities to operate using commercial practices. Ten years later came the National Water Initiative, which serves as a blueprint for how utilities plan for, manage, measure and price water.

As a result, Australian water utilities function in many ways like a commercial business does. They have boards of directors, earn profits, pay dividends, undergo external audits and are measured against industry standards and benchmarks.

While U.S. utilities are held to environmental regulations that drive capital improvement and maintenance decisions, they do

not face the financial regulatory mandates that would prompt them to rethink business practices.

Following the Australian Model

When the city of Seattle took on asset management initiatives more than a decade ago, it brought in Australian experts to help set the framework for its system. Terry Martin, acting asset management division director, says that Australian experts recognized that, just like in their own country, business-practice changes would require significant cultural changes.

"Water organizations are very engineering-based and therefore highly risk-averse," Martin says. "The old paradigm often suggests that a pump station should have three pumps because three is better than two. That might make sense from a risk perspective, but perhaps not from a financial perspective. There's a whole message around where [a utility] can take on more risk that is often unpopular with the rank and file."

But the drivers of change are different in the U.S. than in Australia. As with Seattle and many other municipalities, the push toward changes in business practices is driven by local management, not by state or federal authorities. "In Australia, their regulators are in the weeds, telling them how to do certain things," Martin says. "The U.S. doesn't have anything like that. It takes a particularly driven CEO or city council to bring about change.

There's no overarching urgency for it like in Australia."

The Australian model also demands a multidisciplinary approach. Australian utilities take a very integrated approach when looking at budgets across different disciplines, which can be a challenge at U.S. utilities that take a more siloed approach.

Martin says that when Australian experts began working on Seattle's system, they were immediately confronted by several siloed business practices, including those in the field. "They were perplexed as to why we couldn't combine our water pump station crews with our wastewater pump station crews," he recalls. "We couldn't because they are from different unions. There were numerous examples of those kinds of differences."

Although U.S. utilities are not held to the same financial regulations as Australian ones are, they are subject to market forces. In today's environment, the increased cost of regulatory compliance, coupled with an ongoing need to raise prices on rate-payers, could drive business-practice changes in the coming years.

However, without consistent financial drivers, Martin maintains that asset management adoption in the U.S. will continue at a slower pace compared to Australia. "The risk is that a [water utility] managing director may come in, crack the whip for four years and leave," he says. "You can see a good aspiring program turn to dust because the CEO goes away." ■

Data: Canadian Water Utilities

Differences in the U.S. and Canadian Markets

WATER INFRASTRUCTURE ASSET MANAGEMENT: ADOPTING BEST PRACTICES TO ENABLE BETTER INVESTMENTS DATA

Ten percent of the survey respondents were from Canada, and overall, their responses align with the responses of U.S. participants, with no statistically significant difference in the percentages of asset management practitioners in the U.S. and Canada. This alignment is not surprising since Canadian water utilities are also struggling with aging infrastructure and increasingly stringent environmental regulations, and they also lack financial regulatory drivers.

However, there are also some significant differences between the U.S. and Canadian markets in terms of the practices used, how asset investment decisions are made and the types of drivers for the market.

Current and Future Use of Practices

There is more interest among the Canadian respondents in adopting the practices that involve strategy and performance measurement than in the U.S., with a significantly higher percentage of U.S. respondents stating that they have no plans to implement five out of these six practices.

Development of an Asset Management Policy

- U.S.: 17% of respondents have no plans to implement.
- Canada: 7% have no plans to implement.

Strategic Asset Management Plans

- U.S.: 19% have no plans to implement.
- Canada: 9% have no plans to implement.

Consideration of Environmental, Social and Economic Costs and Benefits

- U.S.: 28% have no plans to implement.
- Canada: 15% have no plans to implement.

Benchmarking/Needs Assessment

- U.S.: 28% have no plans to implement.
- Canada: 9% have no plans to implement.

Developing and Monitoring Customer-Service and Asset-Service Levels

- U.S.: 27% have no plans to implement.
- Canada: 13% have no plans to implement.

This demonstrates a more engaged response to a strategic approach to asset management in Canada than in the U.S. This may be due in part to the existence of some government programs, like Ontario's Municipal Infrastructure Investment Initiative (MIII), which helps municipalities to identify and prioritize their infrastructure needs and fund critical projects. However, policies encouraging asset management are still confined to the local and provincial levels.

See the glossary on page 37 for definitions of some of the technical terminology such as Strategic Asset Management Plans.

Making Decisions on Asset Investments

Seventy-nine percent of respondents from U.S. utilities report considering risk assessment important, compared to just 60% of those in Canada. Given the roughly equivalent level of asset management implementation in these two countries, this gap suggests greater industry awareness of risk assessment in the U.S. than in Canada.

While the topic of risk is featured prominently by large U.S. industry organizations in their educational materials, including the American Water Works Association and the American Public Works Association, more research is needed on the cause of this differential in order to help encourage greater use of risk assessment in the Canadian market.

Drivers for Asset Management

Ninety-three percent of respondents from Canadian utilities report that reputation and perception of performance have a positive influence on their decisions to initiate, or to consider initiating, asset management, compared to 74% of U.S. respondents. Again, active government efforts to promote the use of asset management in Canada may have raised the profile of practitioners among their peers and the general public.

Regulators also play a more influential role in Canada than they do in the U.S., with 91% of Canadians considering them to have a positive influence on the decision to adopt asset management, compared to just 61% in the U.S. In addition, 13% of the respondents from Canada report that expanding regulatory requirements are the most important reason for adoption, compared to only 3% in the U.S.

When it comes to the triggers for adoption by their own utilities, U.S. respondents have greater concerns about capturing the knowledge of their retiring workforces (26% , versus 13% from Canada) and about improving service levels for the same or lower cost, 25% versus 15% from Canada. Strong public focus in the U.S. on retiring baby boomers and fiscal austerity may help account for these differences.

Methodology:

Water Infrastructure Asset Management Study Research

WATER INFRASTRUCTURE ASSET MANAGEMENT: ADOPTING BEST PRACTICES TO ENABLE BETTER INVESTMENTS

The research in this report was conducted by McGraw-Hill Construction (MHC) in order to explore trends in U.S. and Canadian asset management for water infrastructure. A total of 451 qualified respondents employed at a U.S. or Canadian utility that provides drinking water services completed the online survey, with 90% from the U.S. and 10% from Canada.

Sample sources included utilities from partnering industry associations and MHC's Dodge Database.

■ Industry associations

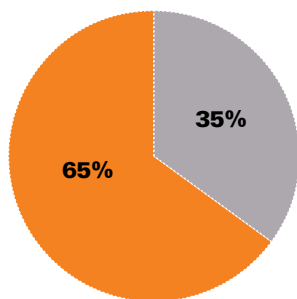
- American Public Works Association (APWA): 75 respondents
- American Water Works Association (AWWA): 214
- National Association of Clean Water Agencies (NACWA): 3
- National Association of Water Companies (NACW): 21
- Water Environment Federation (WEF): 130

■ Dodge Database: 8 respondents

Distribution of Asset Management Practitioners and Non-Practitioners

Source: McGraw-Hill Construction, 2013

- Currently Use 3 or Fewer Asset Management Practices (Non-Practitioners)
- Currently Use 4 or More Asset Management Practices (Practitioners)



Data were collected from November 6 to 26, 2012. The total sample size benchmarks at a high degree of accuracy: 95% confidence interval with a margin of error of +/-4.6%.

Respondents were screened to work for a U.S. or Canadian utility that provides drinking water services and serves a population of at least 3,300. Respondents must also be involved in decisions on management of water utility infrastructure.

Throughout the report, the findings are shown for all respondents (451), asset management practitioners with 4 or more of 14 practices implemented (291), and non-practitioners with 3 or fewer practices implemented (160). See the chart at lower left for the breakdown of respondents by practitioners and non-practitioners.

In addition, practitioners were placed into a spectrum of implementation:

- Low involvement, defined as 4–6 practices (125)
- Medium involvement, defined as 7–9 practices (85)
- High involvement, defined as 10–14 practices (81)

Utility Profiles

■ Offers Water Services Only/ Water and Wastewater Services (30%/70%)

- Practitioner: 28%/72%
- Non-Practitioner: 32%/68%

■ Publicly Owned and Operated: 86%

- Practitioner: 85%
- Non-Practitioner: 88%

■ Median Number of Employees: 91

- Practitioner: 122
- Non-Practitioner: 71

■ Retail Versus Wholesale Customers

- Both Retail and Wholesale: 57%
- Retail Only: 37%
- Wholesale Only: 6%

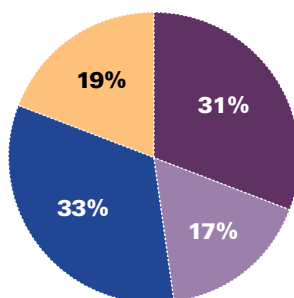
In-Depth Interview Participants

In addition to the industry survey, confidential in-depth interviews were conducted in September 2012 with leaders from five publicly owned U.S. utilities with advanced asset management programs. The annual budgets of the participating utilities range from \$31 million to \$800 million. All supply drinking water, three do wastewater, and one is a wholesale water supplier.

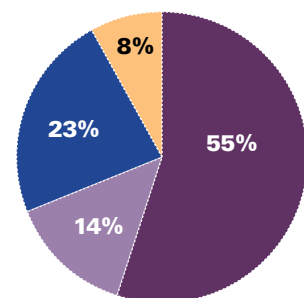
Size of Populations Served by Respondents' Utilities

Source: McGraw-Hill Construction, 2013

Asset Management Practitioner



Non-Asset Management Practitioner



Resources

Organizations, websites and publications that can help you get smarter about asset management for water infrastructure.

McGraw Hill CONSTRUCTION

McGraw-Hill Construction

Main Website: construction.com

Dodge: construction.com/dodge

Research & Analytics:

construction.com/dodge/

dodge-market-research

Engineering News-Record: enr.com

GreenSource: greensourcemag.com

Architectural Record: archrecord.com

Sweets: sweets.com

SmartMarket Reports:

construction.com/market_research

ACKNOWLEDGEMENTS:

The authors wish to thank our premier corporate partner CH2M HILL for helping us to bring this information to the industry. Specifically, we would like to thank John W. Fortin, Scott Haskins, Kevin Johnson, Susan Mays and Nick Pealy for their commitment to and vision for this project.

In addition, we would like to thank the associations that partnered with us in conducting the research and the individuals involved in that process, including Peter King and Nikki Guillot at the American Public Works Association, Ken Mercer at the American Water Works Association, Chris Hornback at the National Association of Clean Water Agencies, Michael Deane at the National Association of Water Companies, and Eileen O'Neill and Lorna Ernst at the Water Environment Foundation.

We would also like to thank the individuals and organizations that shared their experiences with us for the case studies, including Biju George and Scott Maring from Cincinnati MSD, Kevin Campanella from Columbus DPU, Michael Stuhr and Jeff Leighton from Portland Water Bureau, and Stella Madsen and Loretta Gette from the city of Regina.

We also thank Rich Anderson, from the U.S. Conference of Mayors—Mayors Water Council, for his support. Finally, we offer thanks to Debra Rubin from *Engineering News-Record* for her insights and expertise.

CH2MHILL®

CH2M HILL
www.ch2m.com

Research Partners

American Public Works Association: apwa.net

American Water Works Association: awwa.org

National Association of Clean Water Agencies: nacwa.org

National Association of Water Companies: nawc.org

Water Environment Foundation: wef.org

Other Resources

American Society of Civil Engineers

Report Card for America's Infrastructure: asce.org/reportcard

Canadian Network of Asset Managers: cnam.ca

Institute of Asset Management (UK): theiam.org

National Environmental Services Center: nesc.wvu.edu

New Zealand Asset Management Support: nams.org.nz

U.K. Water Industry Research: ukwir.org

U.S. Conference of Mayors: usmayors.org

U.S. Environmental Protection Agency: water.epa.gov/infrastructure/sustain/asset_management.cfm

Water Environment Research Foundation: werf.org

Water Research Foundation: waterrf.org

Water Services Association of Australia: wsaa.asn.au

WATERiD (Water InfrastructureDatabase): waterid.org

■ Design and Construction Intelligence

SmartMarket Report

www.construction.com

McGraw-Hill Construction SmartMarket Reports™

Get smart about the latest industry trends.

For more information on these reports and others, visit
www.construction.com/market_research

