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Water Infrastructure: Opportunities and Challenges for a New Decade

Having cost-effective and reliable drinking water is integral to protecting our nation's health and economic vitality. US Environmental Protection Agency (USEPA) Administrator Lisa P. Jackson has established "supporting sustainable and livable communities" as one of the agency's priorities. The drinking water program's work toward sustainable drinking water systems and infrastructure is central to this goal. As all of us who work in the drinking water sector know, a community's quality of life and economic competitiveness are closely tied to its drinking water system. In this column, I would like to share some thoughts with you about water infrastructure opportunities and challenges for the decade to come.

INFRASTRUCTURE IMPROVEMENT COSTS WILL BE SUBSTANTIAL

To understand where we are, we need to reflect on where we have been. Ten years ago AWWA published its groundbreaking report titled "Dawn of the Replacement Era: Reinvesting in Drinking Water Infrastructure." That report delivered a sobering message: Much of the water infrastructure in the United States was approaching the end of its useful life, and water utilities would face an enormous challenge in ramping up their infrastructure investment during the early decades of the twenty-first century to address replacement needs.

Further validation for this conclusion came in USEPA's 2002 report, "The Clean Water and Drinking Water Infrastructure Gap Analysis." The gap analysis underscored that infrastructure needs will be rising for many years to come and the cost to address them will be substantial.

Subsequent studies and reports have confirmed and reinforced this message. Most recently, USEPA's "2007 Drinking Water Infrastructure Needs Survey and Assessment" indicated \$334.8 billion will be needed for pipe, treatment, storage, source, and other infrastructure over the 20 year period 2007–26. USEPA's needs survey only captures the need associated with meeting the public health protection objectives of the Safe Drinking Water Act. The additional capital investment needs that water utilities will face to address the challenges brought on by factors such as our growing population and our changing climate are beyond the survey's scope and purpose.

WHAT IS SUSTAINABILITY?

What do we mean by infrastructure "sustainability?" The term sustainability has become pervasive in the national dialogue on water infrastructure in recent years, and its meaning continues to evolve. Central to the evolving concept of "sustainable" infrastructure is the recognition that the built, physical elements of drinking water systems make up only a portion of our infrastructure, and an exclusive

focus on this aspect is not enough to ensure that we can supply reliable and affordable drinking water now and in the future. A robust conception of infrastructure acknowledges the importance of understanding the built infrastructure in relationship to the natural or ecological systems with which it is connected as well as the role of the institutions that plan, build, and manage this infrastructure.

Over the past decade the water sector has made significant advances in understanding how to achieve and maintain sustainable drinking water systems and infrastructure. In 2007 AWWA, other major water sector associations, and USEPA identified 10 attributes of effectively managed water sector utilities. These attributes are: product quality, infrastructure stability, community sustainability, financial viability, operational optimization, operational resiliency, customer satisfaction, water resource adequacy, stakeholder understanding and support, and employee and leadership development. The 10 attributes represent the areas that the water sector itself believes are key to further improving utility performance in the years to come. USEPA's priority attention to the areas of infrastructure sustainability and community sustainability is consistent with the water sector's own recognition of the importance of these issues for the future.

Accounting for environmental factors affecting surface water and

groundwater resources is essential to infrastructure sustainability, especially as the effects of climate change continue to grow. Public health engineers and planners are increasingly recognizing the advantages of source water protection as the first of the multiple barriers of protection through which safe drinking water is provided. Ecological approaches to protecting water bodies from contamination will be important tools in effectively maintaining this barrier. In the future climate change will affect not just water quality but also water availability and variability. Now, as we seek to engineer the water systems of the twenty-first century, adapting to global climate change will be a significant driving force. Understanding how the built infrastructure will be affected by changes in the underlying hydrologic systems and precipitation patterns (e.g., increased intensity and fre-

quency of rainfall, changing runoff and recharge patterns, and rising sea levels) will be a foundation of this effort. Working toward sustainability will require us to steer our thinking to new approaches that conserve energy and water and that are more flexible and adaptive to change and uncertainty.

The institutions that plan, build, and manage our water infrastructure will likewise evolve to become more flexible in response to change and uncertainty. Today's leading water utilities are already at the forefront in applying world-class planning and management approaches. Our collective challenge over the coming decade will be to significantly deepen the penetration of these approaches to reach all of our nation's water utilities. In order to provide the continuing level of service customers will expect, utilities will need to have in place a robust understanding of their physical

infrastructure and a long-term vision for the management, repair, and replacement of these physical assets, including the natural assets of their watersheds and underlying aquifers. Management of the finances and operation of a water system is itself critical infrastructure. Decision-making capacity and implementation processes also affect the scope of planning and the ability to appropriately influence demand and pricing for an essential resource that the public counts on being of high quality.

EDUCATING THE PUBLIC IS KEY

The success of water utilities in evolving to meet the challenges ahead will be largely determined by the understanding and support of the customers they serve. The entire water sector must work together to help the public understand the full range of benefits they enjoy as a result of high-quality water supply service. The cost of meeting the infrastructure challenges before us will be significant. Through understanding the relationship between the physical, environmental, and management aspects of sustainable infrastructure, the desired service can be provided as cost-effectively as possible. If customers understand the value proposition of high-quality water supply service, they will be more willing to engage in a productive dialogue about how to pay for it.

The road ahead will not be easy. Institutions at every level of government will be challenged to work together in new ways. The pace of change will be accelerating, and resources will be at an absolute premium. The water sector in the United States is strong and capable. Drawing on our proud tradition—and working together—the coming decade will be one of great opportunity and accomplishment in providing our communities with this vital resource.

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