A reflection and a potential alternative

Wastewater management and the design of its governing systems

Craig Lindell and Michael Hines

The U.S. needs to spend about a trillion dollars on wastewater infrastructure to address nonpoint pollution, enhanced nutrient removal, integrated water resource management, reuse, and the energy costs associated with existing infrastructure.

The governing and institutional systems through which we address wastewater management are more important in reducing costs and increasing effluent quality than any technological consideration. Based on observations, informed by the policy literature and the decisions being made by communities and utilities in the marketplace, we conclude that states need to reassemble existing laws and protocols into governing systems that enable the following goals.

- Recognize the economic realities of citizens and communities as well as the compliance standards of the codes.
- Recognize the potential in a scalable, distributed, and just-in-time approach to sewer system management.
- Understand that collaboration requires methodologies that enable people to think as a group.
- Convert State Revolving Funds into loan guarantee programs to increase available capital.

Transformational change mired

We are at the end of an infrastructure cycle and 25 years into a new policy era. In the infrastructure cycle that is ending, wastewater is a pollutant. In the policy era that is emerging, wastewater is a resource. The management of wastewater as a pollutant is a capital expense. The management of wastewater as a resource is a capital investment.

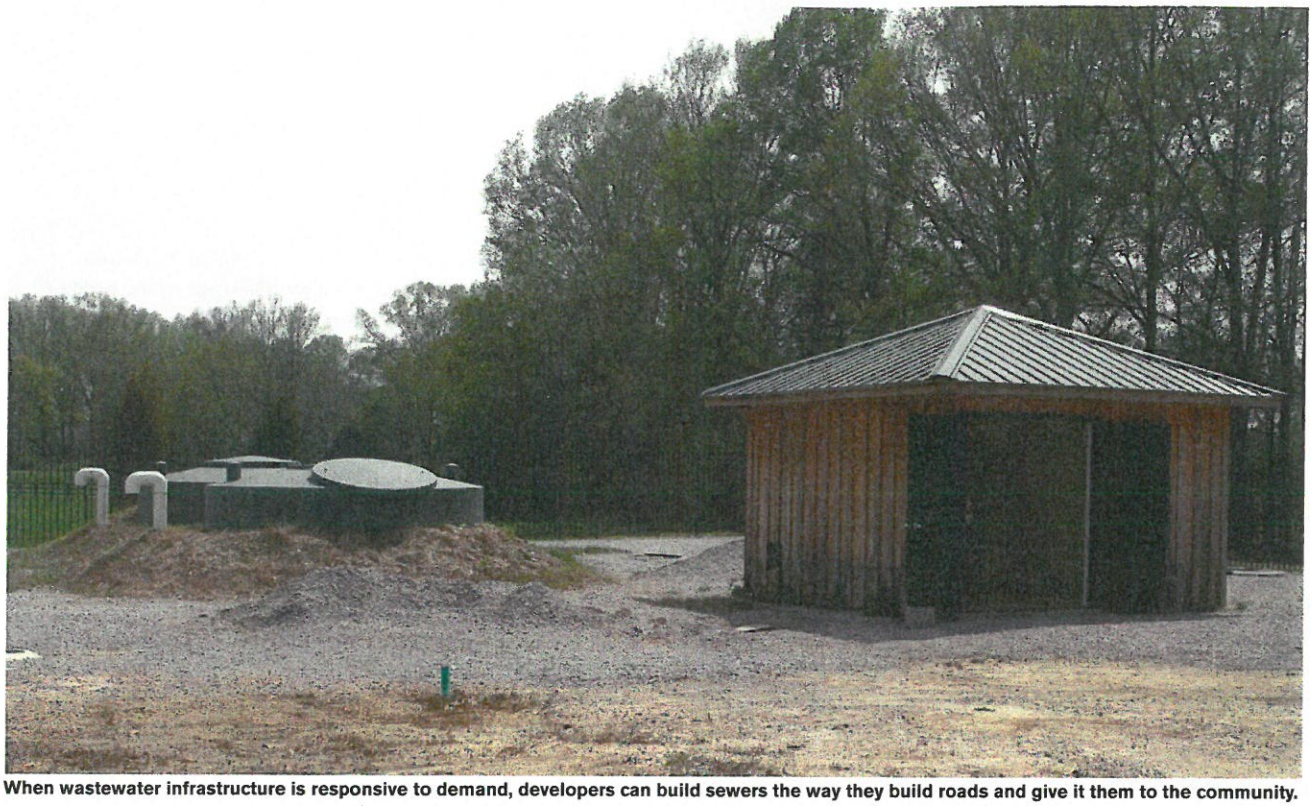
This distinction is profound. The former is capital depleting and the latter is capital forming.

The point source municipal infrastructure that cost $100 billion to build now has a $300 billion infrastructure budget deficit gap. Its programmatic structure required that point source systems be built to a 20-year forward forecast in capacity, be redundant in design, be constructed under prevailing wages, and be procured from the lowest bidder. The short-term benefits went to industry and labor while the long-term debt now burdens communities.

Without systemic change, we are increasing this debt and transferring it to a new generation.

The watershed literature is clear: The framework for integrated water resource and watershed management will be community-based and technology-driven. It will reconcile environmental preservation and economic reality. It will be based on collaboration and not on conflict and it will be led by the private sector and not by government, as described by Larry Selzer, president and CEO of The Conservation Fund (Arlington, Va.) at Watershed '96: Moving Ahead Together. Selzer's remarks were published in the event's plenary proceedings in June 1997.

For a policy framework to be effective, it must be supported by enabling legislation and effective institutional and programatic structures. The 1998 *U.S. EPA Clean Water Action Plan: Restoring America's Waters* recognized the need for new institutional structures and the 2010 report, *Charting New Waters: A Call to Action to Address U.S. Freshwater Challenges,* recognized the need for enabling legislation. However, despite these representations of "what" the framework would require,



When wastewater infrastructure is responsive to demand, developers can build sewers the way they build roads and give it them to the community.

there has been no effort to systematically determine "how" it would be accomplished. This indecisiveness is unnecessary, costly, and civically and ecologically irresponsible

Defining the challenges and options

No one has more accurately summarized the limits of the existing governing systems with respect to fulfilling the aspirations of the watershed agenda than G. Tracy Mehan III, former Assistant Administrator for Water at U.S. Environmental Protection Agency (EPA). It leaps from the middle of his Nov. 30, 2001, presentation titled, *Building on Success – Going Beyond Regulation*, to the Environmental Economics Advisory Committee:

- "The remaining water pollution problems are significantly more complex when compared with the problems that we have already addressed."
- "Complex problems require innovative solutions and entail a change in paradigm."

Similarly, no utility has designed a more comprehensive plan for addressing the broad range of issues associated with wastewater management than the Hampton Roads Sanitation District (HRSD; Virginia Beach, Va.).

At WEFTEC® 2013, Edward Henifin, HRSD managing director, discussed why HRSD is integrating a modular approach to sewer into its strategic plan. In the presentation, "Does Size Really Matter? The Case for Scalable Decentralized Wastewater Treatment," HRSD recognized that, without a distributed approach to sewer, it could not address the needs of small communities and remote natural systems. It could not cost-effectively advance integrated water resources, reuse, and watershed management. It could not significantly address its infrastructure budget deficit gap, and it could not integrate stormwater and wastewater management or address its water–energy nexus.

HRSD's strategic planning for a modular, scalable, and distributed approach to sewer enables it to design and deliver wastewater management that is responsive to demand, code-compliant, and adapted to the unique local conditions that present themselves. It also enables incremental delivery of infrastructure on a just-in-time basis and in a centrally managed network.

Accompanying Mehan's change in paradigm and HRSD's change in its strategic plan have been several policy initiatives that encourage community preservation and the transfer of responsibilities to more local control.

Mike Leavitt, EPA administrator from 2003 to 2005, found environmental discussions extremely difficult because of deep division between the interested parties. He formulated a doctrine to guide such discussions and termed it *Enlibra: A New Doctrine for Environmental Management*. At the heart of Leavitt's Enlibra principles is the recognition that local collaboration among parties is more likely to produce desired outcomes than legalistic confrontation, and that economic incentives created greater public acceptance of solutions.

Accompanying this trend toward localization was the transfer of water quality management to the state and local levels. If we were going to build an adaptive infrastructure where the context includes a broad range of complex circumstances that are relatively unique, we were going to have to design governing systems that encourage and makes possible its implementation through state and local, not federal, legislation.

Taking a modular approach

The Town of Fairhaven, Mass., took the leap into a cooperative process to demonstrate the efficacy of a distributed approach to sewer. Despite years of bureaucratic resistance, the town manager

worked to help 400 homeowners find a solution to a problem that threatened both their personal health and their property values.

The 400 homes were pre-war cottages on an island. The dense glacial till soil was contributing to failing onsite systems. Even though the town manager had observed "there are so many rules you can't get anything done anymore," he had the will and the insight to find a way.

On old soils maps, he noticed a permeable sand layer – a pre-glacial beach about 6 m (20 ft) below the surface – that would minimize the cost of a disposal system. Nevertheless, adequate funding was still an issue.

Ultimately, he took advantage of laws that enable municipalities to repair public hazards on private lands and charge the property owners for the betterment. He organized a strategy wherein public health officials condemned the properties. This allowed the town to impose a schedule of payments sufficient to complete the project. When it was completed, responsibility for the system was transferred to the Fairhaven Department of Public Works. According to the town manager, upon completion of the project, "property values increased 50% and in, some cases, quintupled."

Building from scratch on demand

While Fairhaven focused on using a modular approach to sewer to provide for existing homes, Piperton, Tenn., structured conditions for developers of new homes to enable the town to build a distributed municipal sewer infrastructure that paid for itself. Piperton designed a governing system that provided for a modular approach to sewer built in response to demand. It adopted sewer ordinances to regulate the development of the collection, treatment, and disposal systems rather than regulating them under public health. This made compliance guidelines and permitting simple, clear, and quick. The town became a magnet for developers. Developers received increased density, reduced infrastructure costs, potential for additional homes, and additional value for municipal sewer services.

HRSD, Fairhaven, and Piperton each faced very different types of wastewater management issues. HRSD needed to manage municipal systems of disparate sizes, ages, and conditions. Fairhaven suffered from failing individual on-site systems. Piperton had no infrastructure and wanted residential growth. All utilized distributed sewer to solve their unique situations. Each was successful because they were able to work outside of the conventional point-source/public-health based regulatory model. They crafted local ordinances supporting their unique solutions. In doing so, they maintained compliance with overarching state and federal environmental laws.

Drafting new environmental code

Clearly, neither Congress nor state legislatures are likely to totally revamp 50 years of environmental law designed to manage wastewater as a public health or water pollution control problem. However, state agencies and local governments certainly can create new regulatory initiatives under those laws that would allow flexible solutions based on local conditions.

Point-source and environmental health codes are so dominant primarily because they are legislatively empowered. If responsibility for compliance truly has been transferred to the state and local levels, states need to write legislation that addresses what the two existing codes do not. If federal money is not involved, many of the compliance obligations can be funded locally. Ironically, there is potential for a new code that supports total maximum daily load compliance for subsurface disposal, encourages responsible management, and allows communities to creatively use such intangible assets as variances, ordinances, and tax incentives to leverage the creation of such hard assets as scalable distributed infrastructure.

To achieve such a goal requires state legislation. To successfully legislate a new code, communities need to realize that a scalable, distributed infrastructure that is responsive to market demand enables them to negotiate with private interests to improve the economic, ecological, and quality-of-life issues for their citizens. This common interest in reducing the costs of wastewater management gives communities a common cause to lobby for legislation.

The elements of this legislation would be a new environmental code that enables the following actions.

- Place the management of wastewater under water resource management districts.
- Enable communities to collaborate across political boundaries to sustain the integrity of the natural systems on which they depend.
- Redesign infrastructure from a centralized and fragmented structure to modular and networked structure under central management.
- Recognize and demonstrate that wastewater infrastructure can be designed, built, and financed under current law and without federal assistance.
- Encourage the design of wastewater management to be capital-forming instead of capital-depleting.
- Explore the water–energy nexus from collection system through treatment for resource recovery.
- Convert state revolving funds to loan guarantee programs.

There is a price too high for clean water and most communities know it. To reduce this cost, legislation at the state level must provide the authority and the guidance for institutional and programmatic changes that are capital-forming and incorporate matters of concern to communities.

The dilemma is that, while there is a consensus in the policy literature, there have been very few who have found a path to enacting it. So powerful and recalcitrant are the institutions that govern wastewater and public health that neither the legislative authority that created them, nor the administrative authority that maintains them, nor the policy initiatives that would transform them have been able to alter them.

All public and private wastewater management, public health, and pollution control institutions share common aspirations for a healthy economy and ecological integrity. All share a will, but we have not created the way. More than 25 years of watershed policy literature shows that the choice already has been made. Now, its implementation becomes an ethical imperative.

Craig Lindell *is founder principal at Aquapoint (New Bedford, Mass.).* ***Michael Hines*** *is founding principal at Southeast Environmental Engineering LLC (Knoxville, Tenn.).*