

DIMENSIONS IN INFRASTRUCTURE

DECENTRALIZATION: FROM ONSITE WASTEWATER DISPOSAL TO INTEGRATED WATER RESOURCE MANAGEMENT

“Almost everywhere in the world now, water is discussed and water-related policies are contemplated based on ”watersheds” or “river basins” or other holistic terms. ...Little, if any, distinction is made between drinking, waste, or storm water because all of them effect public health, the environment and the quality of life for communities everywhere.”
(William Bertera, WEF Executive Director)

“Every paradigm will, in the process of finding new problems, uncover problems it cannot solve. And those unsolvable problems provide the catalyst for triggering the paradigm shift.” (Joel Barker: Paradigms)

A few weeks ago a small town in northern Arkansas gave the rights of way to a developer so he could install sewer lines to collect and treat the wastewater from new developments. The public private partnership addresses a number of issues. The town will have a performance-based infrastructure for which it will not have to pay. The sensitive topography of the Ozarks and its endangered species will be accommodated. Development will have a common wastewater utility avoiding the proliferation of septic systems. The wastewater will be treated and re-used for irrigation.

This is the “new world of water. If we are going to confront the issues surrounding water quality and supply in adaptable, holistic and integrated terms, we will need an equally adaptable, holistic and integrated approach to infrastructure design. Some would call it a change in paradigm. In fact, market forces are verifying Barker’s insight and the continued reticence of some to engage in institutional change on behalf of affordable environmental results is unfortunate if not tragic.

The, all too often, consequences of this reticence is that we get septic systems by default, and thirty-one states consider septic systems their primary or secondary source of ground water pollution.

In the “new world of water” the command and control structures and most of the language and processes that supported the public health and water pollution control approaches to wastewater management are not sufficient to address nonpoint pollution, the integrity of the coastal zone ecology, sustainable watershed standards or water reuse. Neither are they sufficiently adaptable, affordable or readily deployable to address the market demands for timely infrastructure, environmental quality and economic development that accompany residential development pressures and water quality and supply security.

We have known this for some time.

In his “Principles of Public and Private Infrastructure Delivery” John Miller concludes, “Federal funding for big ticket federal infrastructure is over. ... Continued legislative and administrative zeal to perfect more and more details of this single procurement method is fundamentally wrong. ... We need to step back from the current paradigm. ... This is because the next transformation of America’s infrastructure is upon us, and the nation (both public and private) needs, once again, to find a stable mix of delivery and finance mechanisms to get the tasks done.”

. All the indicators suggest that finding a viable “stable mix” from within the current paradigm of central sewer and onsite disposal is a process destined to fall short of expectations. At the highest policy levels this is clearly understood.

In November 2001 Tracy Mehan, newly appointed Assistant EPA Director for the office of Water, established a new expectation for the EPA and the country. In his presentation to the Environmental Economics Advisory Committee on November 30, 2001, "Building on Success – Going Beyond Regulation", he noted, "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."

Mehan is on this same theme when he suggests that "the legal structure is not available in the Clean Water Act for a frontal assault on nonpoint pollution", and that "addressing 21st century problems like polluted runoff, suburban growth, drinking water security, ground water/surface water interactions, invasive species, microbes in drinking water, and atmospheric deposition demands a more modern approach to environmental protection- an approach grounded in sound science, innovative solutions and broad public involvement."

It is arguable that it is in the spectrum of change from water pollution control to integrated water resource management that a decentralized approach to infrastructure development increasingly reveals its potential. This spectrum of change may be briefly characterized as follows:

- Conventional onsite treatment and disposal is the precursor to decentralized wastewater management. Adding aerobic treatment and management protocols became the first advancement toward decentralization.
- The acknowledgement in the 1997 EPA report to the Congress that decentralization was no longer a temporary solution waiting for conventional sewer but rather a permanent long-term solution to be evaluated on the same basis as traditional sewer.
- The recognition of "decentralized sewer" is the first indication that decentralization is a new architecture for infrastructure development and not simply an onsite or near site phenomenon.
- "Network-centric distributed sewer" is a concept transferred from the Department of Defense's concept of "network-centric battle field warfare." In this model it is the battlefield and not the "platform centric battle group" that informs the skills, technologies, processes and organizations through which it will be attacked." Translated to the environment it is the watershed and not regulation that will determine the ambient ecological standards by which it will be managed.
- Finally, wastewater treatment will not be an end in itself; rather it will be a subset of a holistic strategy such as integrated water resource management.

The paradigm shift occurs where there is a distinctive change in the pattern of the field. Many will argue that the shift to the management of onsite systems or the adoption of distributed sewer is a paradigm shift. But these would not challenge the efficacy of the current command and control approach to wastewater treatment and disposal. It may be a change in technique but it is not a change in paradigm.

I suspect this is the origin of much of the confusion.

The change in paradigm will occur when the site informs the terms and conditions under which it will be sustainably managed. In Acton, Massachusetts the local health agent has

identified and regularly monitors the water quality in a number of micro-watersheds. For Brent Ragor, Acton's bright, young, professional health officer, watershed integrity is essential to public health. Not far away in Orleans, Massachusetts the local health board has changed its mission to include environmental health as essential to public health. For the Orleans Board of Health this includes a healthy coastal ecology.

In its most productive form, "Decentralization" is neither the extension of the onsite tradition nor the breaking up of the central sewer approach. Decentralization is an adaptive new architecture that incorporates the following characteristics:

- It is infrastructure on demand and readily deployable.
- It is performance-based, modular, scalable, adjustable, and affordable.
- Planning is continuous, iterative, and strategic but also adaptable.
- It enables the site to define the technologies, processes, organizational structures, and operating skills that will most effectively achieve the desired environmental results.
- It encourages collaborative efforts among community and watershed interests to moderate financial and environmental risk.
- It provides local government and its managers a variety of "solutions tracks" that meet the economic demands of a dynamic and growing community, as well as community preservation and watershed discharge standards of the receiving natural system (e.g., total maximum daily load or TMDL) discharge standards)..

This approach to decentralization is still emerging. However, programs such as the Total Maximum Daily Load (TMDL) standards and Wisconsin's Green Tier environmental results permitting as well as critical areas of concern such as the Cape Cod and Chesapeake Bay coastal ecologies whose damage is a threat to the local economies are leading a shift in paradigm.

Almost all the indicators also suggest that we are returning to a period of privately funded infrastructure and that it will be most effective in resolving a broad range of societal and environmental issues if it is freed from public sector constraints and allowed to respond to economic demands as well as the environmental terms and conditions of the site. The story of the Ozarks town with which we began is illustrative of the new role of the private side.

With these changes of approach and policy, and with their associated changes in demands, has come the emergence of a cost-effective, sustainable, and distributed infrastructure for wastewater treatment and water resource management. This is an opportunity for cities and counties to take advantage of the distributed or decentralized approach to infrastructure. This approach lends itself to being incrementally planned, permitted, installed and modified on a just-in-time basis.

Alternative collection, treatment, and disposal technologies have been reviewed and approved for application in the vast majority of states. Small-diameter and low-pressure collection systems reduce the cost of excavation typically associated with gravity sewer, as well as the inflow and infiltration that usually accompany these sewers. Subsurface drip irrigation systems adapted from agriculture reduce the need for surface-water discharges and their associated permitting difficulties and costs. These permitted alternatives create opportunities to avoid the expense of

gravity collection, treat them to high effluent standards such as <10 mg/l Total Nitrogen and < 1mg/l Phosphorous and discharge into soils not satisfactory for conventional subsurface disposal.

Today, the products, skills, and processes are available to alter both the expectations for and the costs of a wastewater infrastructure. Service providers, sources of funds, knowledgeable third-party experts, and experienced engineering firms are in place in most states and regions. The flexibility City and County Manager's will need in order to manage in what have been acknowledged to be "times of permanent financial crisis" such as "rightsizing of projects" and "buying services competitively" is now available through decentralization for infrastructure construction and renewal.

My experience with county commissioners suggests that they are focused on three fundamental themes. They want to preserve the character of their counties, provide essential infrastructure to preserve the environment and support economic development.

However, it is our opinion, It is our contention that it is not until we think of decentralization in terms of a network centric architecture with an integrated water resource management objective that its full potential and these aspirations will begin to be realized .

The existing infrastructure has run its course and it needs re-construction as well as re-formation if it is to adequately address the new realities of watershed and integrated water resource management. Unless we craft a new framework for watershed conservation and wastewater re-use, our acknowledged obligations to produce a comprehensive infrastructure that is adaptable, affordable, and rapidly deployable with the capacity to pay for itself will be transferred to a future generation.