



Drinking Water and Wastewater Infrastructure in Appalachia

AN ANALYSIS OF CAPITAL FUNDING AND FUNDING GAPS

REPORT SUMMARY

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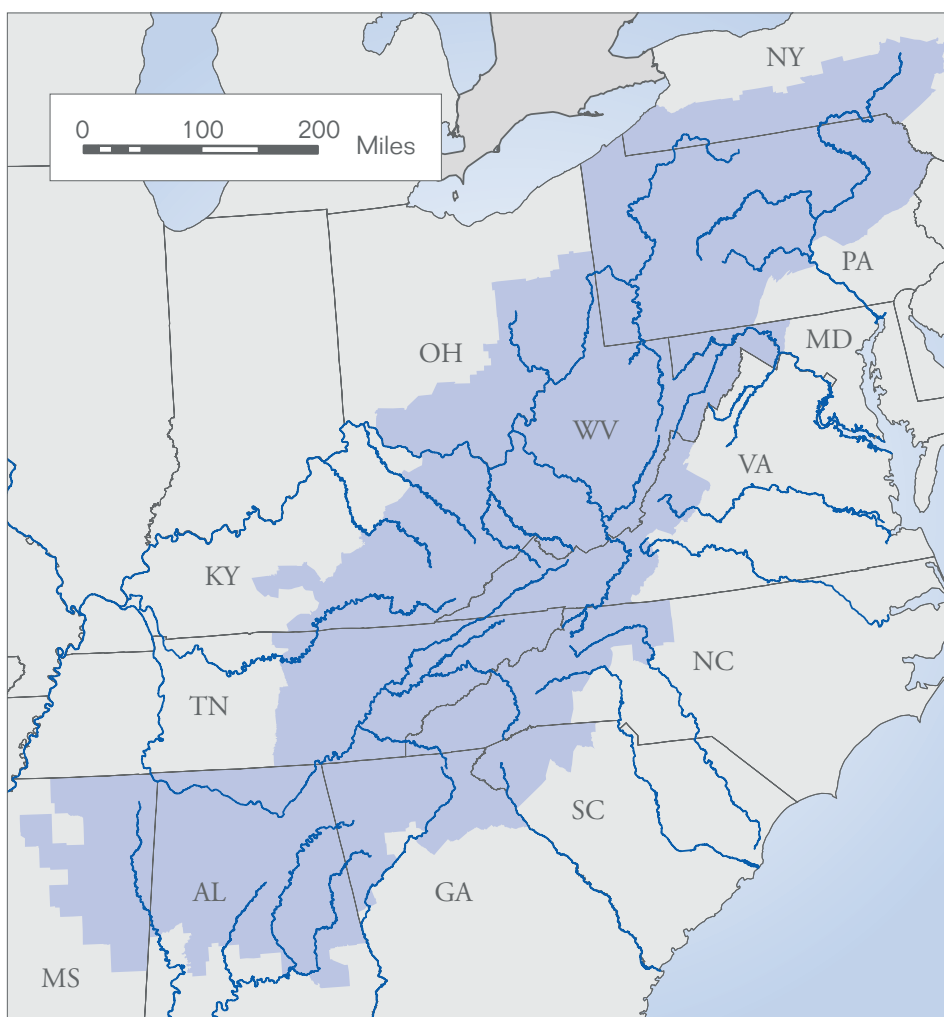
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Introduction

The way in which water and wastewater services are funded in the United States changed dramatically from the 1970s to the 2000s. The country moved from a sizable federal grant program that accompanied the passage of the 1972 Clean Water Act to a more complex system in which a smaller amount of funding is delivered through grants and loans administered by a wide variety of federal and state agencies. Around 2000, several national studies concluded that the level of spending on water and wastewater services in this new, more complex system was inadequate to meet the nation's needs.

FIGURE 1
U.S. Rivers Originating in Appalachia



In light of these conclusions, the Appalachian Regional Commission (ARC), one of the remaining important sources of federal grants for water and wastewater infrastructure in Appalachia, contracted with a team led by the University of North Carolina Environmental Finance Center (UNCEFC) to assess the needs and the gaps in funding for water and wastewater infrastructure in Appalachia.* The overall goal of the study was to help ARC and other policy makers understand how these services were being provided and funded and what might be done to meet the needs of the region more effectively.

Appalachia is home to the headwaters of almost all the important rivers of the eastern United States (see Figure 1). Thus whatever happens to Appalachian waters has major consequences for the nation as a whole.



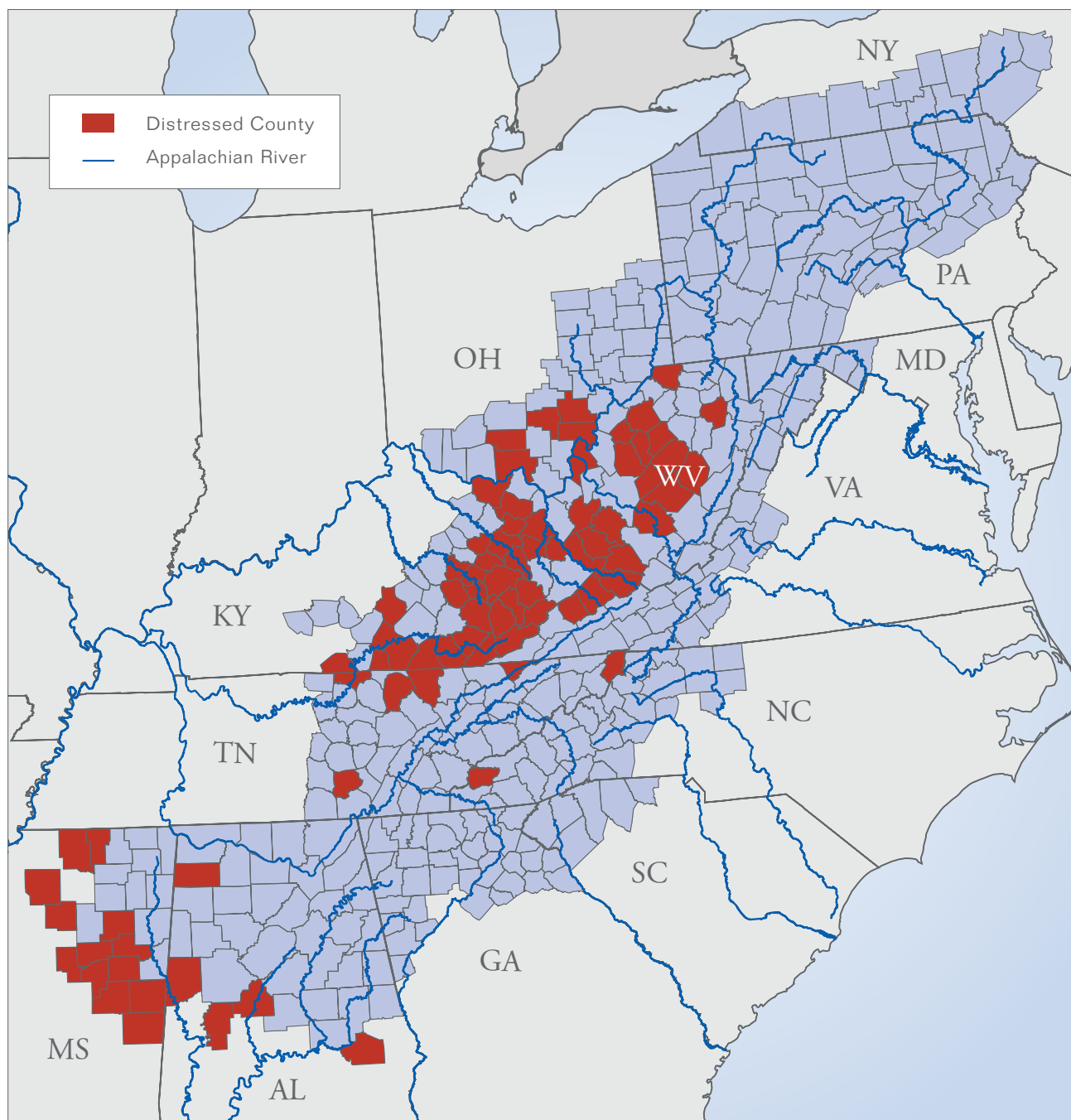
An Appalachian mountain stream

*The other team members were the Blue Grass Area Development District, the Syracuse University Environmental Finance Center, and the University of Maryland Environmental Finance Center.

Introduction *(continued)*

For ARC purposes, Appalachia consists of 410 counties, encompassing all of West Virginia and parts of Alabama, Georgia, Kentucky, Maryland, Mississippi, New York, North Carolina, Ohio, Pennsylvania, South Carolina, Tennessee, and Virginia—an area of 200,000 square miles and about 23 million people (8 percent of the U.S. population) (see Figure 2).

FIGURE 2
A Map of Appalachia as Defined by ARC, Highlighting the Counties Designated in 2005 as Distressed



Sources: Prepared using U.S. Geological Survey data and 2005 ARC economic status data

Introduction *(continued)*

By any definition Appalachia is a rugged land of extremes. Its generally ample rainfall and, in some subregions, its groundwater resources bless it with water for drinking and wastewater assimilation. But its topography, its legacy of water pollution from economies built around resource extraction, and the extremely low fiscal capacity of many of its communities make funding water and wastewater improvements difficult.



CLOCKWISE FROM TOP LEFT: An abandoned coal-processing facility, part of Appalachia's legacy of resource extraction; a picturesque stream, possibly impaired by mine drainage, bacterial contamination, or acid rain; substandard housing, typical in some distressed counties of Appalachia; a water intake, illustrative of Appalachian communities' dependence on their streams for drinking water; one of Appalachia's many rivers, home to a rich diversity of freshwater fish

What Is the Current State of Water and Wastewater Services in Appalachia?

- Coverage by community water systems—that is, systems that provide water to the public for human consumption and serve at least twenty-five year-round residents—has expanded significantly in the last fifteen years in Appalachia (to reach 74 percent of the population) but still lags significantly behind national coverage (85 percent of the population). Wells remain the primary source of water in some subregions (more than 75 percent of households in portions of the Appalachian Highlands).
- More people in Appalachia (33 percent) are served by small and medium-sized systems than people in the nation (20 percent) are. In general, the smaller the system, the higher the costs.
- Community water systems in Appalachia rely much more heavily on surface-water sources than systems in the nation as a whole do—18 percent versus 11 percent. Systems that rely on surface water tend to have significantly higher operating and capital costs than systems that treat groundwater.
- Proportionately more people in Appalachia than in the nation as a whole rely on onsite wastewater disposal. In 1990, the last year in which national data were collected by the Census Bureau, 52 percent of Appalachian households reported being served by public sewers, versus about 75 percent of U.S. households.



Wastewater disposal and treatment facilities, found in varying conditions and numerous sizes in Appalachia, ranging from shabby outhouses to modern, centralized systems

TOP TO BOTTOM: Youthful entrepreneurship; a storage facility of the Northwest Kemper Water Association; the water tower in Gaffney, South Carolina, home of the state's Peach Festival

The Current State of Water and Wastewater Services in Appalachia *(continued)*

- In the scattered Appalachian places where careful surveys have been made, substantial numbers of people have failing onsite systems or no wastewater treatment systems at all. In many parts of the region, some individual systems are nothing more than “straight piping” (discharge of waste directly into a stream).
- Some of the highest-quality and most outstanding resource waters in the eastern United States are in Appalachia, but in many areas, surface water and groundwater are seriously impaired. For example, West Virginia has 878 impaired streams, covering approximately 6,170 stream miles.
- Water and wastewater infrastructure and services in Appalachia are intrinsically linked to and influenced by the natural environment of the region. Most of the environmental factors in Appalachia lead to higher costs, especially in the Highlands.



Courtesy of North Carolina Department of Environment and Natural Resources



CLOCKWISE FROM TOP RIGHT: A residence discharging waste into surface water via a pipe (barely visible in the brush); a nutrient-loaded lake in western Appalachia; two treatment facilities



What Are the Critical Water Infrastructure Needs in the Region?

- Appalachia accounts for about \$26 billion of the drinking water and clean water needs documented or projected in recent EPA surveys. This number is clearly a lower limit on the entire water and wastewater needs of the region. The surveys omit or underreport many needs, either because of their definitions of what constitutes “need,” their methodologies, or their rates of nonparticipation.
- This estimate does not fully include many categories of needs that are disproportionately high in Appalachia, such as improvements to failing septic systems, extension of service to people with inadequate or no central water and wastewater treatment, watershed restoration for areas impaired by historic resource extraction and industrial activity, and better storm-water handling. Nor does the estimate include the funds necessary to operate and maintain new facilities or facilities that have been neglected. Taking these other needs and underreporting into consideration raises the region’s total capital requirements to at least \$35–\$40 billion.
- Several states carry out needs surveys that are separate from the EPA surveys. Their definitions of “need” and their methodologies differ widely. The more comprehensive surveys that some states have carried out have uncovered needs not reported in the EPA surveys.



ABOVE: The overflow mechanism of a system designed to discharge both sanitary sewage and storm-water runoff directly into streams, now recognized to threaten public health; LEFT: a water system in disrepair

What Public Capital-Funding Options Are Currently Available to Meet Critical Infrastructure Needs?

- Relatively few communities in Appalachia, especially in economically distressed counties, have credit ratings for water and wastewater purposes from major rating agencies. This lack of creditworthiness limits their direct access to the private capital market.



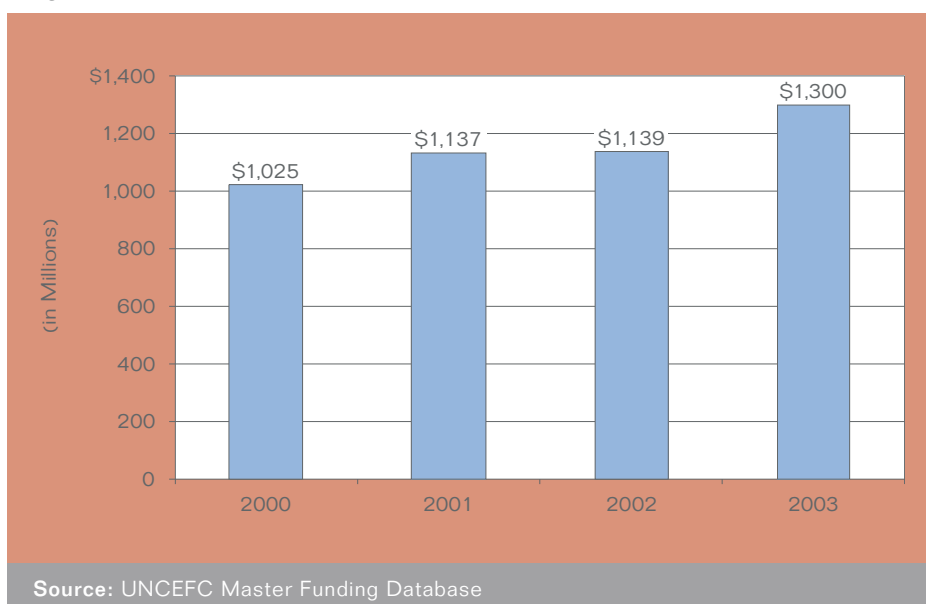
- From 2000 through 2003, federally supported and state-supported programs disbursed about \$4.6 billion in grants and loans for water and wastewater infrastructure in Appalachia (see Figures 3 and 4).
- The special programs established by individual states accounted for 22.8 percent of the public fund investments. Such programs have been important in some states and nonexistent in others. States in Appalachia employ vastly different funding strategies, which lead to major differences in the types of assistance and incentives that reach local communities.

- Capital funding comes from a wide variety of independent and autonomous sources, making planning and management of applications, and timing of grants, loans, and matches a significant challenge for communities.
- The number of public funding programs and the amount of public funding to upgrade existing decentralized wastewater systems in Appalachia or build new decentralized ones are extremely limited.
- A statistical analysis conducted as part of the study indicated that the distribution of water and

wastewater infrastructure funding in Appalachia was significantly and positively related to needs identified by the EPA's 2000 Clean Watersheds Needs Survey. (A "significant" relationship is one that could not have occurred by chance.) The distribution of funding also was significantly and positively related to violations of the National Pollutant Discharge Elimination System and incidences of waterborne diseases.

- Funding sources for project planning and other up-front aspects of water and wastewater projects are relatively few.

FIGURE 3
Disbursements in Appalachia by Federally Supported and State-Supported Programs, 2000–2003



Public Capital-Funding Options *(continued)*

FIGURE 4

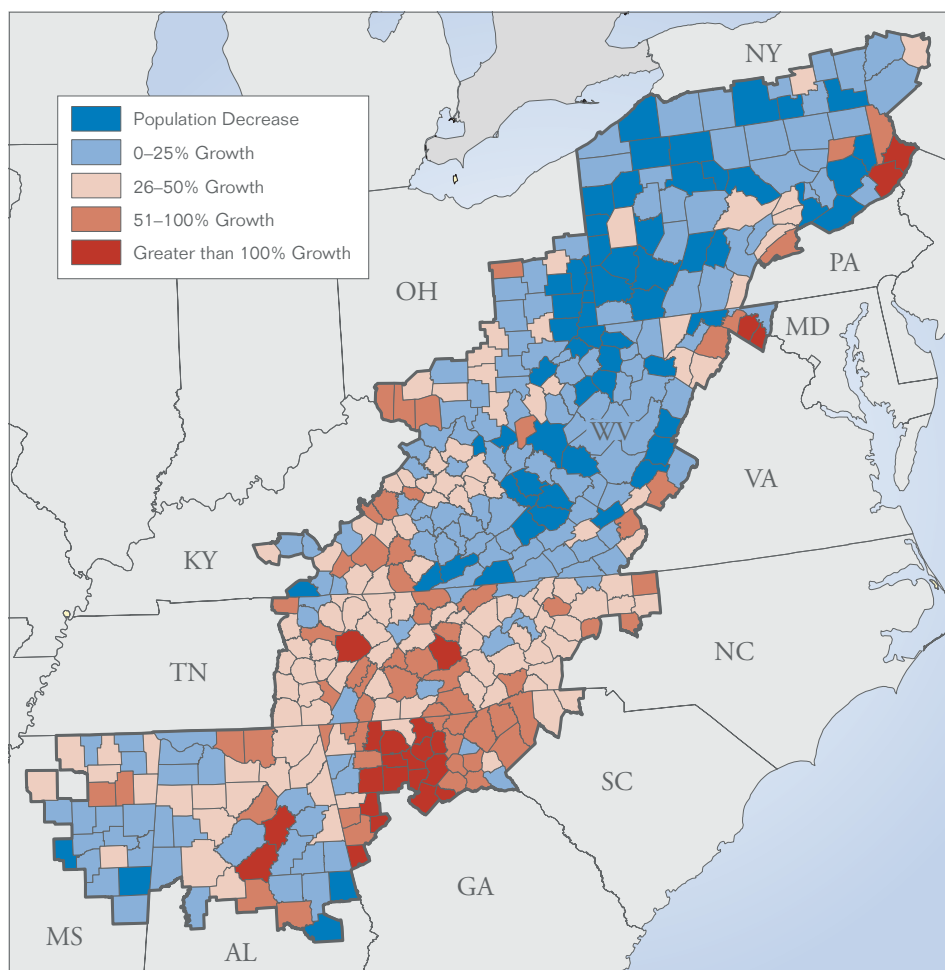
Disbursements in Appalachia by Major Water and Wastewater Programs, 2000–2003



What Types of Gaps Exist, and What Is the Capacity to Bridge Them?

- At the system level, many small utilities have insufficient revenues to cover future cash-flow requirements, once debt repayments and increased operating costs linked to new facilities are taken into account. These utilities are characterized by small and often shrinking customer bases. In some cases, even if grants for capital were available, the utilities would be unable to meet the operating costs associated with their facilities. These utilities are characterized by small and often shrinking customer bases (see Figure 5).
- In comparison with the nation as a whole, households in many Appalachian counties are paying a higher proportion of their income for water and wastewater services, so high in several areas for large numbers of households that asking them to pay more for improved service is infeasible. This household affordability gap has become the critical challenge for many utilities.
- Management shortfalls in the region range widely. At one end of the spectrum, some small systems are unable to support trained and educated staff. At the other end, some large systems have yet to shift from a reaction-oriented paradigm characterized by high maintenance costs and continual capital-stock crises, to a more aggressive approach that includes asset management systems, proactive investments, and ongoing staff training.

FIGURE 5
Population Change in Appalachian Counties, 1970–2000



STORM WATER CHARGE		9.00
WATER CHARGES:		
CURRENT WATER	11.04	
SERVICE CHARGE	4.88	
TOTAL WATER CHARGES		15.92
SEWER CHARGES:		
CURRENT SEWER	22.08	
SERVICE CHARGE	8.39	
TOTAL SEWER CHARGES		30.48
Due Date	8/04/08	Amount Due
		99.17

A household water bill. Assessing the full cost of water and sewer provision through water bills would lead to prices far beyond the financial capacity of many Appalachian households.

What Financial Management and Funding Strategies Are Likely to Have the Biggest Impact on Service in the Region?

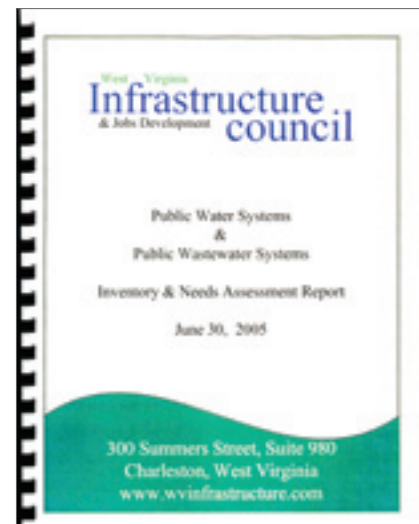
- In general, no single strategy or group of strategies identified in recent national studies of water and wastewater infrastructure will close the gap between services and needs in Appalachia as a whole. Instead, strategies must be designed and deployed on the basis of particular community characteristics.
- Regionalization—with its attendant consolidation of providers—offers widely varying possibilities for achieving economies of scale in Appalachia. It has helped some communities pool their resources and reduce costs enough to remain viable. However, some states have a history of regional entities and have institutional and regulatory frameworks favorable to regional systems. Other states have a go-it-alone culture, a historic model of a single provider prevalent in their system of government, and a relative lack of tested regional models. Promoting regionalization in these latter states requires addressing the structural obstacles.
- Appalachia has shown that many communities can contribute to meeting their needs but many cannot generate adequate revenue to meet future needs with price increases alone. Implementing “full-cost pricing”—that is, setting rates at a level that generates sufficient revenues to cover all the capital and operating costs of providing service—offers only limited promise for bridging the capital gap in many parts of Appalachia, particularly in small and low- or negative-growth communities. The additional revenue from even large price increases will never cover the funding gap for many Appalachian systems. Without external subsidization, many of these systems will either collapse completely or slowly decline because of lack of system maintenance and investment.
- Some funding programs encourage or require communities to follow the principles of full-cost pricing to the extent possible, before receiving funding. Such inducements or requirements often result in greater community contributions, showing that affordability constraints were less than previously stated.
- Privatization offers some communities a way to attain the economies of scale that regionalization brings, as well as access to greater technical and managerial capacity than is likely in a go-it-alone approach. Equally important, large multiple-jurisdiction for-profit providers offer rate-setting and institutional options not readily available to isolated single-jurisdiction systems.
- Private companies often do not have incentives for entering into the most remote and impoverished areas of Appalachia. Although they have clearly helped bridge the infrastructure capital gap in many communities, a number of their bridging strategies ultimately carry a significant cost to the customer.



Private water companies, heralded by some as a potential means of improving water provision, dismissed by those who want water provision to remain in public hands

What Steps Can Funding Agencies and Technical Assistance Providers Take to Improve and Expand Service in the Region?

- For many communities with marginal fiscal capacity, careful manipulation of funding terms may offer the best hope of stretching limited public dollars. In some situations, long-term loans (for thirty or forty years) can make a capital project feasible for a community.
- The degree of cooperation and coordination among different funding programs varies significantly across Appalachia. Some states have coordination strategies and institutions that streamline local funding requests and assist in matching and optimizing different funding sources. In other areas of the region, the go-it-alone approach requires individual communities to navigate the complex funding options and seek the best deal they can get.
- External grant funding remains an essential component of an overall funding strategy. Without a significant amount of such funding, a certain number of communities would be unable to generate sufficient revenue to protect the public health and their surface-water quality. Some states in the region have integrated funding programs and strategies that rely on small amounts of grants to leverage loan funds, enabling communities to access the capital they need while covering the majority of the costs themselves.
- Some individual funding programs and some groups of funding programs carefully design funding packages that include a mix of grant and loan funding. In states where such coordination is weak and grants are not strategically linked to loans, communities consistently seek out grant funding even if they clearly have the ability to take on loan financing.



TOP RIGHT: A publication of the West Virginia Infrastructure and Jobs Development Council, one of the region's most effective funding and coordinating agencies, helping other funding programs reach their beneficiaries more effectively and efficiently; RIGHT: an Appalachian town hall, its modesty suggesting a limited capacity to implement sophisticated management techniques



Contact Information



ARC is a federal-state partnership created in 1965 by the Appalachian Regional Development Act to promote the economic and social development of Appalachia. The act, as amended in 2002, defines the region as 410 counties, encompassing all of West Virginia and parts of Alabama, Georgia, Kentucky, Maryland, Mississippi, New York, North Carolina, Ohio, Pennsylvania, South Carolina, Tennessee, and

Virginia—an area of 200,000 square miles and about 23 million people. For more than 40 years, ARC has funded a wide range of programs in Appalachia, including highway corridors; community water and wastewater facilities and other physical infrastructure; health, education, and human resource development; economic development programs and local capacity building; and leadership development.

For more information about ARC and its other projects, visit www.arc.gov call (202) 884-7700

or write to

ARC, 1666 Connecticut Avenue N.W., Suite 700, Washington, DC 20009-1068.



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The Environmental Finance Center based at the School of Government at the University of North Carolina at Chapel Hill is an interdisciplinary organization for teaching, assisting communities, and conducting policy analysis. Faculty and students working with the center concentrate on helping improve the financing and the delivery of environmental goods and services.

For more information on the center, or for a copy of the full report on funding gaps and needs in Appalachia, visit www.efc.unc.edu call (919) 843-4956

or write to

Environmental Finance Center, CB# 3330 Knapp-Sanders Building, University of North Carolina at Chapel Hill, Chapel Hill, NC 27599-3330.

The UNC center is one of a group of university-based centers that concentrate on problems in the financing of environmental services. The Environmental Protection Agency originally established the centers to bring the work of researchers in the universities directly to bear on local environmental problems.

For more information on the Environmental Finance Center Network, visit www.efcnetwork.org.