4
Capital Needs for Water and Wastewater Infrastructure in Appalachia

Despite the number of needs assessments that have covered parts of Appalachia, no one existing survey is perfectly suited for generating needs estimates for Appalachia as a whole. Different studies provide complementary and occasionally conflicting information about the needs facing Appalachian communities. Furthermore, the UNCEFC research team's examination of selected local communities across the region suggests that even the most comprehensive needs efforts often fail to portray the reality of the on-the-ground challenges facing communities.

Those limitations aside, having even rough estimates can provide Appalachian policy makers with a basic understanding of how the region compares with the rest of the country and, more important, how the needs relate to current resources for public capital funding (explored in detail in chapter 5). This chapter offers estimates of the portion of needs from state and national studies that can be reasonably attributed to Appalachia.

The Clean Watersheds Needs Survey

The CWNS is the only needs survey that covers all of Appalachia and includes data that can be accurately presented at the county level without additional modeling. The documented needs for each Appalachian county based on the 2000 CWNS data appear in appendix A. The CWNS covers nine categories of needs (see Table 4-1). Categories I–V focus on the needs for infrastructure to collect and treat wastewater that are most commonly included in state inventories. Categories VI–IX cover needs that are linked to activities affecting surface-water quality but that are not normally considered water and wastewater needs.

Table 4-1. CWNS Needs Categories

Category	Description
I	Secondary wastewater treatment
II	Advanced wastewater treatment
III-A	Infiltration/inflow correction
III-B	Sewer replacement/rehabilitation
IV-A	New collector sewers and appurtenances
IV-B	New interceptor sewers and appurtenances
V	Combined-sewer-overflow correction
VI	Stormwater management programs

Category	Description
VII	Non-point-source pollution control
VIII	Confined animal-point-source pollution control
IX	Mining-point-source pollution control

Source: Environmental Protection Agency, *Clean Watersheds Needs Survey 2000* (Washington, D.C.: EPA, 2003).

The moment that a community decides to collect wastewater from individual homes, it becomes responsible for a chain of interrelated facilities and processes, all of which have associated capital costs. In most cases, "collector" lines carry wastewater from homes along side streets to larger "interceptor" lines. As these lines age, they develop cracks and holes that allow water to flow in freely or to filter in. Even the newest systems have some problems with "inflow" and "infiltration," but many older systems have so many infiltration problems that they become completely overloaded during wet weather. When that happens, a mixture of untreated wastewater and inflow water overflows from manholes or overloads small treatment plants, resulting in insufficient treatment before being discharged. Wastewater treatment plants employ different treatment technologies. However, almost all plants rely on the same physical and biological processes to carry out primary and secondary treatment. Treatment standards for wastewater effluent are highly dependent on where the wastewater is discharged. Communities that discharge wastewater into impaired or nutrient-sensitive waters often are required to implement advanced treatment to improve effluent quality and to reduce further the concentration of nutrients like phosphorus and nitrogen.

The data that EPA collects and reports for categories I–V are based exclusively on actual documented needs, whereas the data that it collects and reports for categories VI-–IX include needs that were calculated through modeling. Both treatment facilities and collection systems planned and in operation (hereafter referred to as "facilities") were listed in the 2000 CWNS.[48] Thirty-eight percent (1,571) of Appalachia's 4,110 included facilities reported having project needs (see Table 4-2). The needs ranged from a few thousand dollars for improvements in collection systems in dozens of small communities, to more than $1.4 billion for the Jefferson County (Ala.) Valley Creek Wastewater Treatment Plant. (Of the ten project needs with the highest price tags, Jefferson County, which includes the city of Birmingham, has four, totaling $2.1 billion. That is 15 percent of the total category I–V needs of Appalachia.)

[48] Many of the facilities did not complete the survey, but all provided their names.

Table 4-2. Documented Needs for Wastewater and Collection Systems in Appalachia (in Thousands of Dollars), by Type

Appalachian Counties in . . .	Category I	Category II	Category III-A	Category III-B	Category IV-A	Category IV-B	Category V	Cate-gories I–V Total
Ala.	$ 1,312	$ 922,542	$112,497	$1,127,855	$ 342,902	$ 43,866	–	$ 2,550,974
Ga.	52,973	94,286	18,515	20,908	849	828	–	188,359
Ky.	158,849	51,907	14,409	68,982	323,364	141,654	$ 7,677	766,842
Md.	11,063	70,724	12,586	14,034	16,767	10,025	151,940	287,139
Miss.	14,976	17,484	12,697	5,242	35,651	8,975	–	95,025
N.C.	48,171	29,575	42,259	73,369	244,201	183,528	–	621,103
N.Y.	110,260	40,885	14,175	5,098	47,080	22,718	306,867	547,083
Ohio	91,556	22,901	61,544	3,713	132,043	95,414	192,170	599,341
Pa.	623,979	146,150	62,752	57,100	747,554	123,682	3,482,948	5,244,165
S.C.	394,372	56,557	30	2,382	11,124	50,243	–	514,708
Tenn.	12,588	5,275	3,131	939	26,911	3,380	–	52,224
Va.	59,179	3,373	11,062	6,726	223,186	97,632	–	401,158
W.Va.	297,949	12,086	133,612	48,014	691,236	478,246	869,116	2,530,259
Appalachia Total	$1,877,227	$1,473,745	$499,269	$1,434,362	$2,842,868	$1,260,191	$5,010,718	$14,398,380
Percentage of Appalachia's Documented Needs	13%	10%	3%	10%	20%	9%	35%	100%
U.S. Total	$36,833,000	$20,419,000	$8,165,000	$16,762,000	$14,265,000	$14,844,000	$50,588,000	$161,876,000
Percentage of U.S.'s Documented Needs	23%	13%	5%	10%	9%	9%	31%	100%
Percentage of U.S. Needs in Appalachia	5.1%	7.2%	6.1%	8.6%	19.9%	8.5%	9.9%	8.9%

Source: Environmental Protection Agency, Needs Report data for *Clean Watersheds Needs Survey 2000*, available at www.epa.gov/owm/mtb/cwns, downloaded and compiled by UNCEFC. Headquarters-accepted Categories I–V needs are used in this analysis. U.S. national needs by category obtained from Environmental Protection Agency, *Clean Watersheds Needs Survey 2000* (Washington, D.C.: EPA, 2003).

The documented needs for categories I–V for all of Appalachia account for $14.4 billion of the national documented needs of $162 billion, or close to 9 percent. In each of the categories, the total Appalachian needs range from 5.1 percent to 9.9 percent of the national needs, with the exception of category IV-A (new collector sewers and

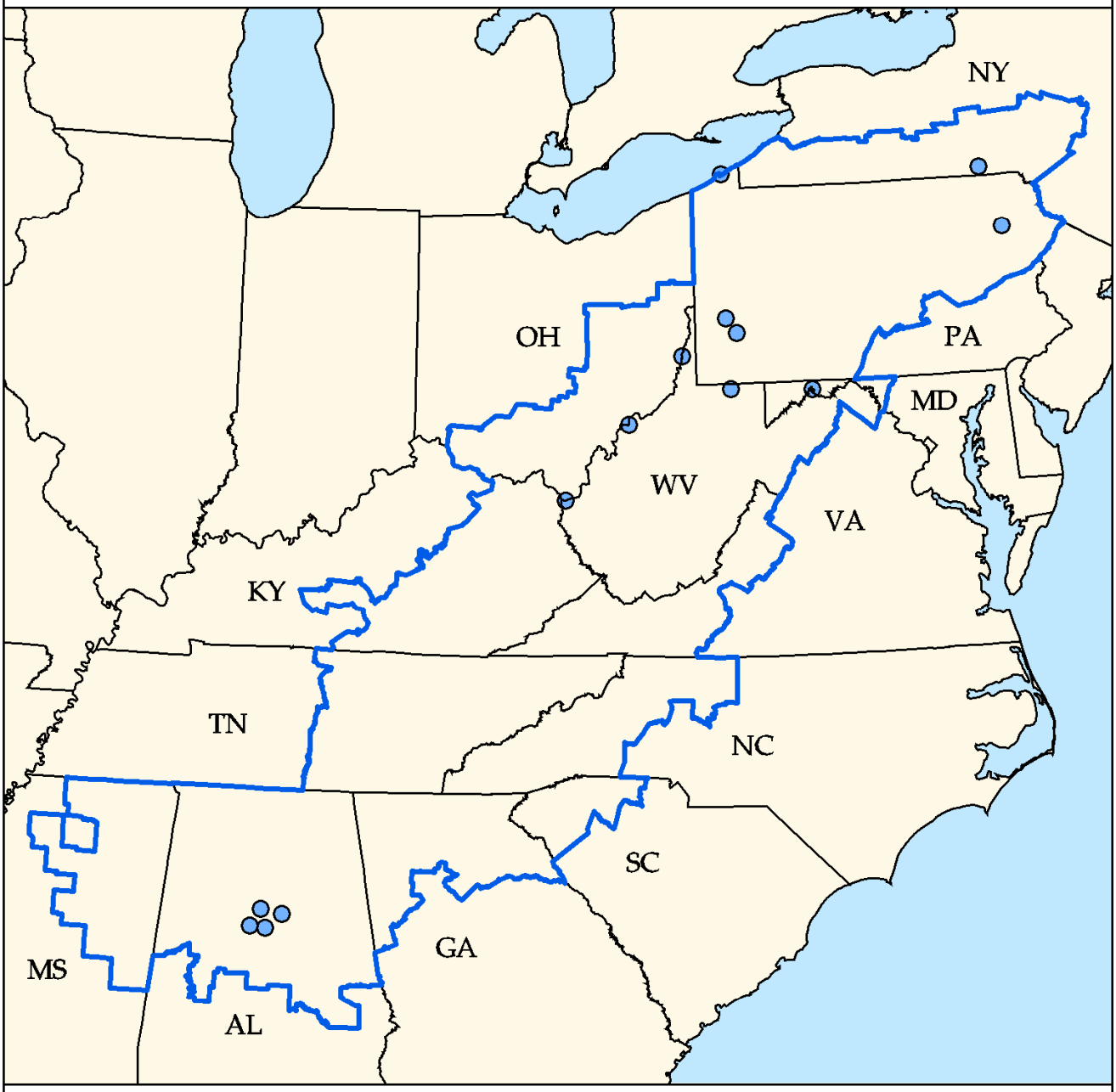
appurtenances), in which the Appalachian needs account for 19.9 percent of the national needs. A substantial portion of the nation's new sewers are being planned in Appalachia, indicating that significant activity is taking place to extend sewer service to households that are not currently connected to wastewater treatment plants. Needs for new collector sewers and appurtenances account for 20 percent of Appalachia's documented needs.

Many older sewer systems were designed to collect both wastewater and stormwater. During wet weather these combined systems commonly overload their treatment facilities, resulting in large amounts of untreated wastewater reaching the environment. Appalachia has considerable problems with combined-sewer overflow, as evidenced by the $5 billion worth of needs to correct them—35 percent of the total documented needs in the region. Nationwide, 31 percent of the documented needs are for these types of corrections. In Appalachia, in total numbers, the problem looks significant for the entire region. However, only six states have correction needs in their Appalachian counties. Pennsylvania accounts for $3.5 billion, or 70 percent of all such needs in Appalachia.

Fourteen facilities in Appalachia represent $4.5 billion in needs, or 31 percent of the total needs of Appalachia (for the facilities' locations, see Figure 4-1). The inclusion of large needs estimates for communities such as Birmingham follows a trend that occurs in many needs surveys: large facilities are much more likely than small systems to have their needs accounted for in the totals (but many more small systems than large ones have their needs included). Not only do needs assessors exert more effort to ensure that large systems participate in needs studies, but the large systems typically have more attention paid to documenting their needs, resulting in more accurate estimates. Both Jefferson County, Alabama, and Accident, Maryland, are under consent decrees to improve their wastewater systems. At the time of the needs survey, Jefferson County, with its legion of engineering reports, was able to produce large, detailed estimates of its needs, whereas Accident was able to identify and document only a small percentage. As is true of many small towns, Accident does not have a capital improvement program. Problems in places like Accident often remain hidden until the last possible moment. Accident is currently making about $3 million worth of repairs to its facilities—$2.8 million beyond what was included in the CWNS.

Across Appalachia, there is great variation in per capita needs per county (see Figure 4-2). In the 2000 CWNS, they ranged from $6,592 in Mingo County, West Virginia, to zero in eighty-two counties. The needs within each county and the variation across counties and states should be viewed in the context of the facilities that actually reported needs. For example, the absence of needs in most of Tennessee is primarily attributed to the abnormally high number of facilities that did not participate in the survey or reported zero needs.

Figure 4-1. Facilities in Appalachia with Greatest Needs in Categories I-V

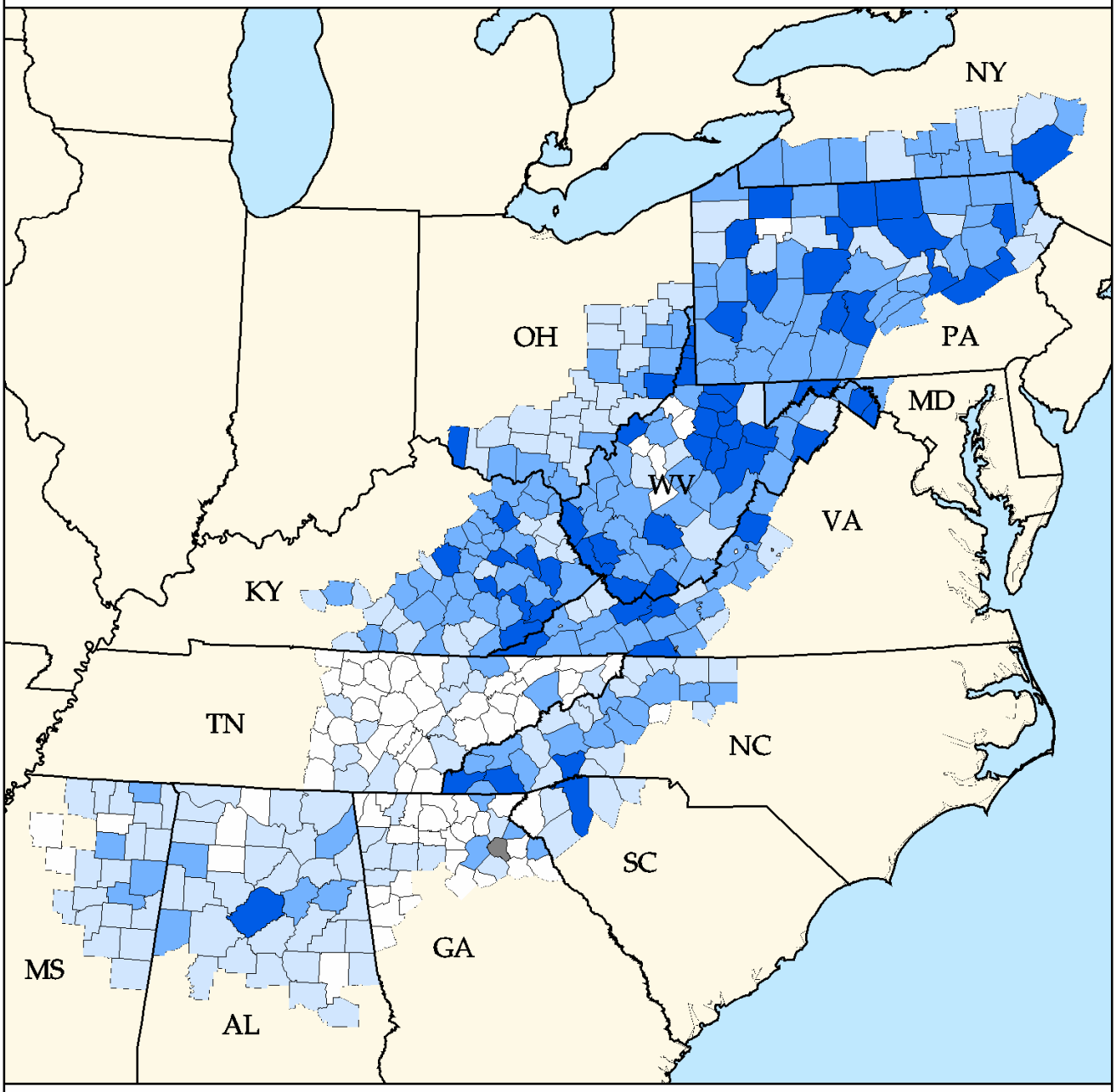


Data Source: Environmental Protection Agency, Needs Report data for Clean Watersheds Needs Survey 2000, available on www.epa.gov/owm/mtb/cwns, downloaded and compiled by UNCEFC. Total headquarters-accepted Categories I-V needs are used in this analysis.

Facilities with Greatest Needs

ARC Boundary

Figure 4-2. Documented Needs per Capita in Categories I-V



Data Source: Environmental Protection Agency, Needs Report data for Clean Watersheds Needs Survey 2000, available on www.epa.gov/owm/mtb/cwns, downloaded and compiled by UNCEFC. Total headquarters-accepted Category I-V needs are used in this analysis. Population estimates from Census 2000 Summary File 1 Table P1. Level of documenting needs by wastewater facilities varied greatly between states, and 62 percent of all facilities in Appalachia did not document any Category I-V needs.

- Did Not Participate in CWNS
- No Documented Needs
- Less than $250
- $250 through $1000
- More than $1000

More than half of all the facilities in Appalachia do not have any documented needs for wastewater and collection systems (for the locations of these facilities, see Figure 4-3). These facilities either did not respond to the needs survey, did not have any projected needs in categories I–V, or did not provide the required documents for their needs to be accepted by EPA in the CWNS. Overall, 62 percent of the facilities did not have documented needs. The proportion ranged from 20 percent in Kentucky's Appalachian facilities to 92 percent in Tennessee's (see Table 4-3). This range underlines the different weight placed on, and the different approaches taken by, the various states in responding to the CWNS.

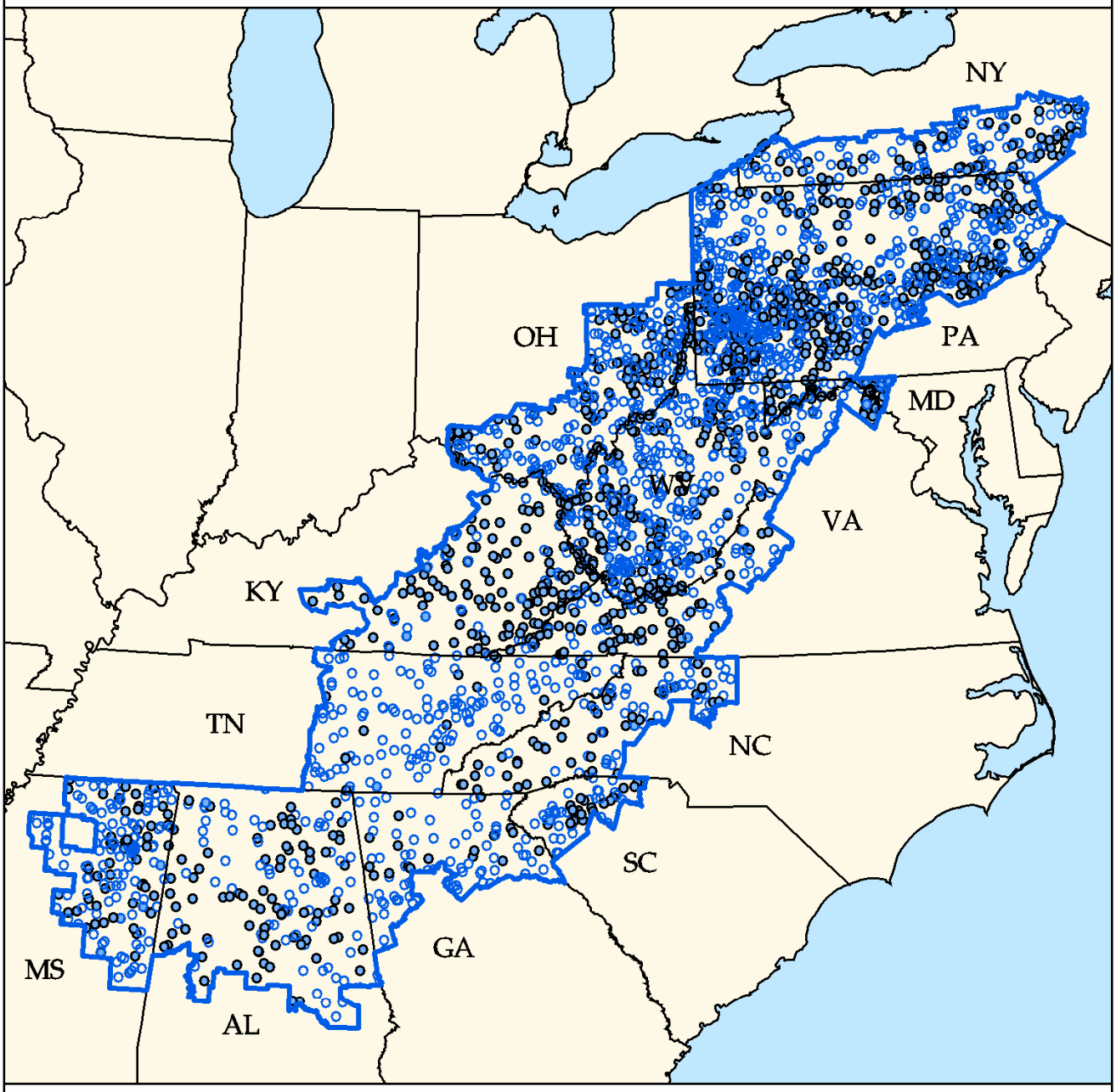
Table 4-3. Facilities with No Documented Needs in Categories I–V

Appalachian Counties in . . .	Number of Participating Facilities in Appalachia	Number of Facilities with No Documented Needs (Categories I–V)	Percentage of Facilities with No Documented Needs (Categories I–V)
Kentucky	187	38	20
Virginia	156	57	37
Maryland	67	26	39
Alabama	171	83	49
West Virginia	684	379	55
North Carolina	181	112	62
New York	202	127	63
Ohio	371	234	63
South Carolina	67	44	66
Pennsylvania	1,559	1,069	69
Mississippi	211	147	70
Georgia	90	72	80
Tennessee	164	151	92
Appalachia	**4,110**	**2,539**	**62**

Source: Environmental Protection Agency, Needs Report data for *Clean Watersheds Needs Survey 2000*, available at www.epa.gov/owm/mtb/cwns, downloaded and compiled by UNCEFC. Total headquarters-accepted Categories I–V needs are used in this analysis.

Analysis of the documented needs per capita for the Appalachian portion of each state is instructive (see Table 4-4). Such an analysis is important for several reasons. As pointed out in chapter 3, the extreme variation in per capita needs, when combined with the variation in effort put in by the needs assessors, suggests that the variation in per capita needs has more to do with how the surveys were done than with actual needs. However, without further research this cannot be proven.

Figure 4-3. Facilities with and without Documented Needs in Categories I–V



Data Source: Environmental Protection Agency, Needs Report data for Clean Watersheds Needs Survey 2000, available on www.epa.gov/owm/mtb/cwns, downloaded and compiled by UNCEFC. Total headquarters-accepted Category I-V needs are used in this analysis. 62 percent of all facilities in Appalachia did not document any Category I-V needs.

No Documented Needs

Documented Needs

ARC Boundary

Table 4-4. Per Capita Documented Needs in Appalachia

Appalachian Counties in . . .	Per Capita Needs
Tennessee	$ 21.06
Georgia	85.33
Mississippi	154.40
North Carolina	406.96
Ohio	411.83
South Carolina	500.37
New York	509.96
Virginia	603.08
Kentucky	671.78
Alabama	899.11
Pennsylvania	901.09
Maryland	1,213.10
West Virginia	1,399.21
Appalachia	**628.91**
U.S.	**$ 575.00**

Source: Environmental Protection Agency, Needs Report data for *Clean Watersheds Needs Survey 2000*, available at www.epa.gov/owm/mtb/cwns, downloaded and compiled by UNCEFC. Total headquarters-accepted Categories I-V needs in each county are used in this analysis. Population estimates from Census 2000 Summary File 1 Table P1.

As noted earlier, the CWNS is a bottom-up survey that relies on accurate information for each facility to ensure that it is represented in the total needs figure. The fact that so many facilities in Appalachia either have not reported their needs (62 percent) or have underreported their needs suggests that the total needs estimate for Appalachia is likely to be much less than what communities will actually need to spend in the coming years. Given the overall high percentage of nonreporting communities and the high variation in reporting across states, the UNCEFC research team thinks that it is impossible to estimate or model accurately what the true need is for Appalachia as a whole or for communities that were not included in the survey. In the face of all the evidence of missing needs and underreporting, the research team concludes that the $14.4 billion estimate in needs for the Appalachian communities that participated in the CWNS can and should be considered as the lower bound of any realistic range. This finding is supported by state needs estimates and by consultations with and surveys of public officials throughout the study region. For example, about 50 percent of the funding program managers who completed the UNCEFC funding survey and were familiar with the needs studies thought that the studies underestimated actual needs. Even EPA, which conducts the CWNS, has concluded that the wastewater needs of the country are

significantly higher than are documented in the CWNS.[49] Other efforts to generate more realistic needs numbers using past CWNS surveys, such as those carried out by the CBO, suggest that actual needs may be as high as two times the raw CWNS estimates.[50]

The Drinking Water Needs Survey

The sampling and modeling methodologies of the DWNS are designed to generate statewide needs totals. After reviewing the modeling approaches and consulting with DWNS analysts, the UNCEFC research team developed a modified modeling procedure that uses national and regional data and Appalachian system stratification to generate needs estimates for community water systems (for a detailed description of the modeling procedure, see appendix G). This modeling approach estimates that $11.4 billion (8.4 percent) of the $136.3 billion needed for community water systems in the United States, is needed for such systems in Appalachia (see Table 4-5). The $11.4 billion estimate amounts to $496 per capita, slightly higher than the national need of $484 per capita. The figures for Appalachia and the United States are similar, partly because the national data were used to estimate Appalachia's needs. If only sampling data from Appalachia are used for the small systems (those serving fewer than 1,000 people), Appalachia's needs increase to $11.6 billion, or $505 per capita (see appendix G for more details).[51]

Table 4-5. Extrapolated Community Water System Needs in Appalachia

Appalachian Counties in . . .	Number of Community Water Systems	Extrapolated Community Water System Needs	Extrapolated Needs per Capita
Alabama	331	$ 1,278,689,572	$451
Georgia	265	992,411,921	450
Kentucky	174	788,488,678	691

[49] Environmental Protection Agency, *The Clean Water and Drinking Water Infrastructure Gap Analysis* (Washington, D.C.: EPA, 2002).

[50] Congressional Budget Office, *Future Investment in Drinking Water and Wastewater Infrastructure* (Washington, D.C.: CBO, 2002).

[51] Analysis by UNCEFC of average per-system needs estimates from data used in *Drinking Water Infrastructure Needs Survey: Second Report to Congress* (Washington, D.C.: EPA, 2001) shows that in Appalachia, per-system needs of small water systems (serving fewer than 1,000 people) are up to 1.5 times greater than the national average per-system small water system needs. Also, more than 61 percent of all community water systems in Appalachia are small water systems.

Appalachian Counties in . . .	Number of Community Water Systems	Extrapolated Community Water System Needs	Extrapolated Needs per Capita
Maryland	65	98,968,226	418
Mississippi	341	521,557,507	847
North Carolina	482	575,952,763	377
New York	584	621,167,425	579
Ohio	324	733,688,883	504
Pennsylvania	1,437	2,836,744,852	487
South Carolina	100	422,908,429	411
Tennessee	274	995,869,970	402
Virginia	301	409,452,309	616
West Virginia	556	1,079,500,918	597
Appalachia Total/Average	**5,234**	**$ 11,355,401,455**	**$496**

Source Number of community water systems in Appalachia from Environmental Protection Agency, SDWIS, database for 4th quarter, fiscal year 2003, frozen in January 2004; downloaded from www.epa.gov/OGWDW/data/pivottables.html and compiled by UNCEFC. National needs estimates from Environmental Protection Agency, *Drinking Water Infrastructure Needs Survey: Second Report to Congress* (Washington, D.C.: EPA, 2001). State needs estimates compiled by UNCEFC from SDWIS and average per-system needs estimates from data used in *Drinking Water Infrastructure Needs Survey: Second Report to Congress* (Washington, D.C.: EPA, 2001). Population estimates from Census Bureau, Census 2000, Summary File 1, Table P1.

In generating its *Gap Analysis* estimates, EPA studied data from follow-up visits to compare actual needs with reported needs. It determined that the numbers reported in the needs survey were substantially lower than actual needs. This led EPA to use multipliers of about 1.5 for some types of needs for large and medium-sized systems.

Other National Studies

Extracting Appalachia's numbers for county and state needs from other national studies is much more difficult than extracting them from the CWNS and the DWNS, given the top-down nature of the estimates. In many cases the national numbers presented in these studies are based on national-level assumptions that make disaggregating the numbers to the county or state level unreliable.

However, studies like the WIN study, the AWWA study, and the EPA *Gap Analysis* can provide valuable insight into Appalachian needs in relation to the needs of other areas of the country. One of the twenty systems analyzed in the AWWA study, Charleston, West Virginia, is in Appalachia. As is true of many systems in the central

part of the region, much of the Charleston system was constructed in the first half of the twentieth century (for a case study of Charleston, see appendix E). Systems installed during this period are estimated to reach their peak replacement needs earlier than the average U.S. system.[52]

State-Level Studies

Some state needs surveys can be broken down at least to the county level, so Appalachian county needs can be extracted from the state totals (for the Appalachian portion of several state needs surveys, see Table 4-6). For states such as Tennessee, whose CWNS numbers are clearly inaccurate, the state-generated numbers suggest that Tennessee's needs are closer in scope to communities in other Appalachian states than the CWNS indicates. The table also illustrates the apples-and-oranges nature of needs surveys that makes accurate comparisons so difficult.

Table 4-6. Water and Wastewater Needs in Appalachia as Determined by State Surveys

State	State Survey Title	Description of Needs	Type	Total Needs	Estimates from EPA Needs Surveys
Ky.	*A Strategic Plan* (1999)	20-year needs to extend sewer service	Sewer	$1,052,710,000	$ 766,842,000
	A Strategic Plan for Wastewater Treatment (2000)	20-year needs to extend water service	Water	878,311,000	995,869,970
Ohio	*Capital Improvement Reports* (1999–2003)	5-year water and wastewater needs	Sewer Water	456,779,424 415,387,782	599,341,000 733,688,883
Tenn.	*Building Tennessee's Tomorrow: Anticipating the State's Infrastructure Needs* (2004)	5-year water and wastewater needs	Water and sewer	1,454,880,037	1,048,093,970

[52] American Water Works Association, *Dawn of the Replacement Era: Reinvesting in Drinking Water Infrastructure* (Denver: the Association, 2001).

State	State Survey Title	Description of Needs	Type	Total Needs	Estimates from EPA Needs Surveys
W.Va.	*Public Water System and Public Wastewater System Inventory & Needs Assessment Report* (2002)	All 557 community water systems and all 292 community sewage system needs	Sewer Water	3,104,717,185 692,455,713	2,530,259,000 1,079,500,918

Source EPA wastewater needs estimates from *Clean Watersheds Needs Survey 2000* (Washington, D.C.: EPA, 2003). Drinking water needs from EPA, SDWIS, database for 4th quarter, fiscal year 2003, frozen in January 2004; downloaded from www.epa.gov/OGWDW/data/pivottables.html and analyzed by UNCEFC. Average per-system needs estimates from data in *Drinking Water Infrastructure Needs Survey: Second Report to Congress* (Washington, D.C.: EPA, 2001).

Kentucky maintains one of the most comprehensive and ongoing systems for documenting needs at the state level. The Kentucky Infrastructure Authority maintains a GIS database of needs throughout the state. For extending water and wastewater service to unconnected households, the per capita needs in the Appalachian counties are much greater than the per capita needs in the rest of the state (see Table 4-7).

Table 4-7. Twenty-Year Water and Sewer Extension Needs in Kentucky

	Needs to Extend Service			Per Capita Needs	
Type	State	App. Counties	Non-App. Counties	App. Counties	Non-App. Counties
Water	$1,573,683,000	$878,311,000	$695,372,000	$769	$240
Sewer	1,973,494,000	1,052,710,000	920,784,000	922	317

Source Kentucky Governor's Water Resource Development Commission, *Water Resource Development: A Strategic Plan* and *Water Resource Development: A Strategic Plan for Wastewater Treatment* (Frankfurt: the Commission, 1999, 2000). Population estimates from Census Bureau, Census 2000, Summary File 1, Table P1.

In summary, the needs surveys conducted by some Appalachian states may report county needs more accurately than national needs surveys do. Where discrepancies exist between them and the national surveys, such as in Tennessee, closer examination is necessary.

Needs by Physiographic Region

The level of needs across physiographic regions would be expected to differ because of the contrasting topography, in terms of both the varying engineering designs and corresponding costs that are specific to certain topographies, and the necessity of supplying community water and wastewater services in areas where onsite systems still predominate, such as in the Blue Ridge province. Examination of EPA's community water system needs and documented wastewater and collection system needs by physiographic region supports this hypothesis (see Table 4-8).

Table 4-8. Wastewater and Drinking Water Needs and Population Served per System, by Physiographic Region

Physiographic Region	Wastewater Population Served and Needs		Community Water System Population Served and Needs	
	Population Receiving Wastewater Collection by Treatment Facility, per Facility	Documented Needs per Capita	Population Served per Community Water System	Drinking Water Needs per Population Served
Atlantic Plain	3,549	$128	2,880	$320
Piedmont	7,135	244	6,010	198
Interior Plains	8,508	336	9,409	250
Blue Ridge	3,574	374	1,937	242
Valley and Ridge	7,166	494	3,983	302
Appalachian Plateaus	6,345	946	3,396	389

Source Environmental Protection Agency, Needs Report data for *Clean Watersheds Needs Survey 2000*, available at www.epa.gov/owm/mtb/cwns, downloaded and compiled by UNCEFC. Total headquarters-accepted Categories I–V needs are used in this analysis. Data from EPA, SDWIS, database for 4th quarter, fiscal year 2003, frozen in January 2004; downloaded from www.epa.gov/OGWDW/data/pivottables.html. Average per-system drinking water needs estimates from data in *Drinking Water Infrastructure Needs Survey: Second Report to Congress* (Washington, D.C.: EPA, 2001), compiled by UNCEFC. Population estimates from Census Bureau, Census 2000, Summary File 1, Table P1.

This analysis suggests an interesting correlation between needs levels and physiographic regions. However, the concerns about data quality outlined throughout this report limit the reliability of this analysis, and its results should be applied cautiously.

Needs by County Economic Status

Every year, ARC classifies all the Appalachian counties into four economic levels. The levels are based on a comparison of the counties with national averages according to three economic indicators (see Table 4-9). The analysis in this report uses county economic status for 2004.

Table 4-9. Criteria for Economic Status Classification of Appalachian Counties

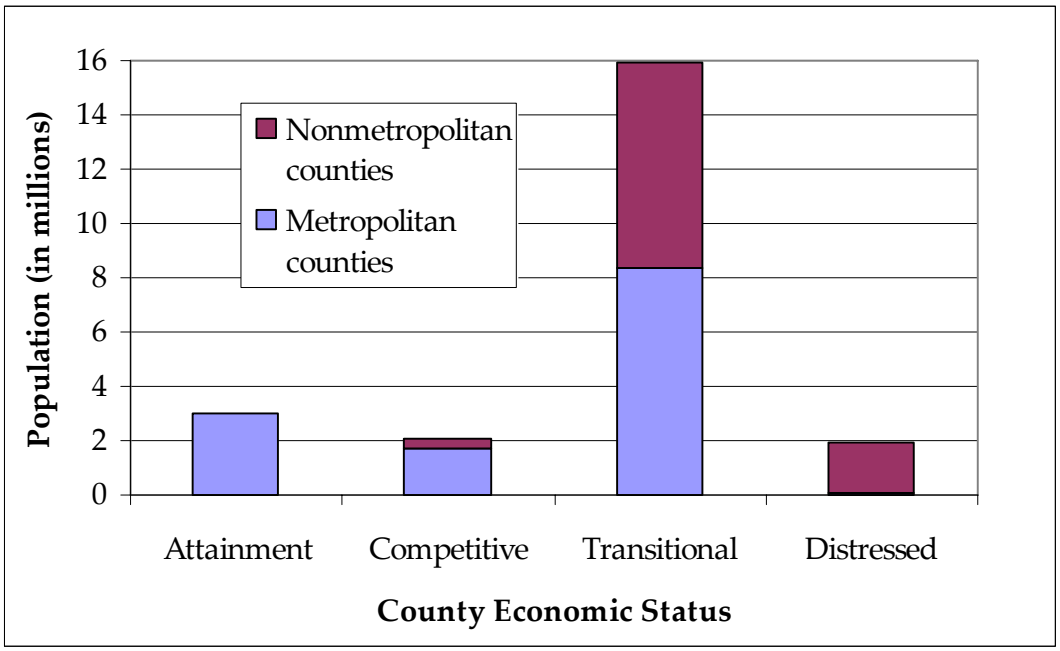
Criterion	Economic Status Classification			
	Attainment	**Competitive**	**Transitional**	**Distressed**
Three-year Average Unemployment Rate	≤ national average	≤ national average	All counties not in other classes	≥ 150% of national average
2000 Per Capita Market Income	≥ national average	80%–100% of national average	All counties not in other classes	≤ 67% of national average
2000 Census Poverty Rate	≤ national average	≤ national average	All counties not in other classes	≥ 150% of national average *or* ≥ 200% and county qualifies on one of other two criteria

Source. Appalachian Regional Commission, Source and Methodology for the map *County Economic Status in Appalachia, FY 2004*, available at www.arc.gov/search/method/cty_econ.jsp.

In 2004 there were ninety-one distressed counties. Distressed counties are of particular interest because they have many fewer resources available to promote self-sufficiency for their populations than other Appalachian counties do, based on their lower per capita income levels, higher poverty and unemployment rates, and smaller population sizes, which amount to reduced labor forces. On average, distressed counties have a population size of 21,000, which is 38 percent of the average population size in all Appalachian counties (about 56,000).

On the whole, slightly less than 2 million people (8 percent) live in distressed counties, primarily in nonmetropolitan ones (see Figure 4-4). Carter County, Kentucky, and Lawrence County, Ohio, are the only two metropolitan counties in Appalachia that are distressed. On average, county population size is smaller for distressed counties than it is for counties with a higher economic status level (see Table 4-10).

Figure 4-4. Population of Metropolitan and Nonmetropolitan Appalachian Counties, by County Economic Status



Source County economic status from Appalachian Regional Commission, *County Economic Status in Appalachia, FY 2004* (available at www.arc.gov/index.do?nodeId=2146). Metropolitan status, as defined by the Office of Management and Budget in 2000, provided by the Appalachian Regional Commission (personal communication with authors, 4 November 2003). Population estimates from Census Bureau, Census 2000, Summary File 1, Table P1.

Table 4-10. Population of Appalachian Counties, by County Economic Status

Economic status	Number of counties	Total population	Average county population
Attainment	8	3,014,461	376,808
Competitive	22	2,046,604	93,027
Transitional	289	15,925,690	55,106
Distressed	91	1,907,262	20,959
All	410	22,894,017	55,839

Source Appalachian Regional Commission, 2004. Population estimates from Census Bureau, Census 2000, Summary File 1, Table P1.

Of the 4,110 treatment facilities and collection systems included in the 2000 CWNS, 567 (13.8 percent) are located in distressed counties. The wastewater infrastructure

needs per Appalachian facility documenting needs average more than $9 million, ranging from more than $4 million per facility in distressed counties to about $30 million per facility in attainment counties (see Table 4-11).

Table 4-11. Wastewater Infrastructure Needs in Appalachia per Facility and per Capita, by County Economic Status

County Classification	Average Needs per Facility	Average Needs per Capita
Attainment	$29,843,766	$634
Competitive	14,629,563	572
Transitional	8,725,997	644
Distressed	4,208,135	554
All	$ 9,165,105	$629

Source Environmental Protection Agency, Needs Report data for *Clean Watersheds Needs Survey 2000*, available at www.epa.gov/owm/mtb/cwns, downloaded and compiled by UNCEFC. Total headquarters-accepted Categories I–V needs are used in this analysis. Population estimates from Census Bureau, Census 2000, Summary File 1, Table P1. County economic status from Appalachian Regional Commission, 2004.

Per capita, however, there is no large difference between the needs of facilities in distressed counties and the needs of facilities in nondistressed counties, despite the fact that a much lower percentage of distressed county residents are actually served by (and pay sewer bills to) centralized facilities. In summary, distressed areas have per capita needs similar to those of nondistressed counties but fewer well-off rate payers, and fewer rate payers in general, to meet the burden.

Of the 5,234 Appalachian community water systems listed in the SDWIS database, 638 are located in distressed counties. On average, distressed counties have seven community water systems, which is half or less than half the number of systems in nondistressed counties (see Table 4-12). Furthermore, the populations served by these systems are smaller in size than those in nondistressed counties (see Table 4-13). Distressed counties' community water systems serve a population of nearly 8,000, on average.

Table 4-12. Community Water Systems in Appalachia, by County Economic Status

County Classification	No. of CWSs	Population Served per CWS	Average No. of CWSs per County
Attainment	132	119,368	17
Competitive	364	52,126	17
Transitional	4,100	20,574	14
Distressed	638	7,914	7
All	5,234	24,901	13

Source: Data from Environmental Protection Agency, SDWIS, database for 4th quarter, fiscal year 2003, frozen in January 2004; downloaded from www.epa.gov/OGWDW/data/pivottables.html and compiled by UNCEFC. County economic status from Appalachian Regional Commission, 2004

Note: CWS = community water system.

Table 4-13. Drinking Water Infrastructure Needs in Appalachia per Community Water System and per Person Served, by County Economic Status

County Classification	Needs per CWS	Needs per Person Served
Attainment	$24,567,729	$191
Competitive	19,082,612	326
Transitional	7,052,729	353
Distressed	3,864,707	497
All	$ 7,989,679	$316

Source: 1999 Drinking Water Needs Survey data, obtained by e-mail from Cadmus Group, 23 March 2004, compiled by UNCEFC.

Likewise, nonmetropolitan counties have fewer systems per county (11) and smaller community water systems (serving less than 12,000 people per system, on average) than metropolitan counties.[53]

On average, community water systems in Appalachia have $8 million in infrastructure needs. The needs grow according to the economic status of the county,

[53] Data from Environmental Protection Agency, SDWIS, database for 4th quarter, fiscal year 2003, frozen January 2004; downloaded from www.epa.gov/OGWDW/data/pivottables.html and compiled by UNCEFC.

from $4 million per system in distressed counties to about $25 million per system in attainment counties.

Again, though, on a per capita level, the trend is reversed. The average community water system's per capita needs increase as the economic status of the county decreases. Thus, on average, community water systems in distressed counties have greater needs per person served ($497) than systems in nondistressed counties ($191–$353). These findings imply that in Appalachia the burden of needs for drinking water infrastructure is greatest on those being served by community water systems in distressed counties or nonmetropolitan counties, where resources are fewer and incomes are lower but per capita needs are greater.

Regulatory Needs as Water and Wastewater Funding Needs

Including regulatory needs in an assessment of the adequacy of funding for water and wastewater infrastructure may be unprecedented. However, without an adequate regulatory system, the quality of water and wastewater services will not be assured.

Anecdotal accounts and occasional published news reports suggest that regulators in the Appalachian states have unusually large needs—in other words, that their budgets, human resources, and levels of political support fall behind those in other regions of the country. For example, in 1998, citing EPA officials and a study from the magazine *Chemical and Engineering News*, Ken Ward of the *Charleston Gazette* reported that West Virginia's water-quality regulators were seriously underfunded.[54]

Confirming or refuting this suggestion of disproportionately low regulatory funding for water quality in Appalachia is difficult, if not impossible. The UNCEFC research team has attempted to assess it using three sources: data supplied directly to UNCEFC by the Environmental Council of the States (ECOS); a report, *State Environmental Expenditures and Innovations*, compiled by the National Association of State Budget Officers (NASBO) in May 2000; and an interim report by the Association of State and Interstate Water Pollution Control Administrators (ASIWPCA) in April 2002.[55] The data

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[54] Ken Ward, "Regulators Lacking Funds: EPA Upset," *Charleston Gazette*, 25 January 1998.

[55] ECOS data from spreadsheet provided to Richard Whisnant, on file at UNCEFC; National Association of State Budget Officers, *State Environmental Expenditures and Innovations* (Washington, D.C.: the Association, May 2002), available at www.nasbo.org/publications/infobriefs/enviro_expend2000.pdf; Association of State and Interstate Water Pollution Control Administrators, *State Water Quality Management Resource Analysis: Interim Report on Results* (Washington, D.C.: the Association, April 1, 2002).

collection and presentation methods in these reports make disaggregating costs for Appalachia difficult.

The ECOS data provide the most insight into potential regulatory funding gaps. They suggest that there may be a significant difference between environmental budgets inside the region and environmental budgets outside it. Comparing per capita spending for all environmental programs in fiscal year 2003, the UNCEFC research team found that Appalachian states spent $53.17, while non-Appalachian states spent $79.97. This comparison includes West Virginia among the Appalachian states. In the ECOS data, West Virginia is an outlier for spending. If it is excluded from the comparison, the gap between Appalachia and the rest of the country widens further: $40.03 for the Appalachian states other than West Virginia, still $79.97 for the rest of the nation. (For a discussion of the methodology used for this analysis and for the complete results, see appendix H.)

Application of Needs Estimates to the Policy Challenges Facing Appalachian Communities

Taken together, the EPA needs surveys indicate that communities in Appalachia have approximately $26 billion in water and wastewater infrastructure needs. However, there is ample evidence that communities will actually have to pay far more than this to ensure services that meet basic public health and environmental standards. Given the manner in which the surveys were carried out, it is impossible to estimate exactly how much more communities will have to pay, yet detailed needs extrapolations by others suggest that the number could easily be in the range of $35 billion–$40 billion. Once again, this number does not include the additional funds, certainly in the billions, needed to address the thousands of substandard and failing individual wells and onsite (septic systems to straight pipes) sanitation systems, nor does it include the funds that will be necessary to operate and maintain new facilities or facilities that have been neglected in the past.

In general, because so many state and federal funding policy decisions are justified under the rubric of responding to unmet capital needs, having a general estimate of capital needs is essential to an informed policy dialogue. The UNCEFC research team thinks that a range of $26 billion–$40 billion provides a realistic metric for understanding the challenges facing the region as a whole, especially for purposes of comparison with the public funding amounts presented in the next chapter. However, as large as these numbers are, they do not portray the full set of challenges facing individual states, counties, and communities. Any macro analysis of needs must be balanced by an examination of the challenges facing individual communities, such as those that have been profiled for this study (see appendix E).