

Building Tennessee's Tomorrow: Anticipating the State's Infrastructure Needs

July 2012 through June 2017

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June 2014

The Honorable Ron Ramsey
Lt. Governor and Speaker of the Senate

The Honorable Beth Harwell
Speaker of the House of Representatives

Members of the General Assembly

State Capitol
Nashville, TN 37243

Ladies and Gentlemen:

Transmitted herewith is the twelfth in a series of reports on Tennessee's infrastructure needs by the Tennessee Advisory Commission on Intergovernmental Relations (TACIR) pursuant to Public Chapter 817, Acts of 1996. That act requires the Commission to compile and maintain an inventory of infrastructure needed in Tennessee and present these needs and associated costs to the General Assembly during its regular legislative session. The inventory, by law, is designed to support the development by state and local officials of goals, strategies, and programs to

- improve the quality of life of all Tennesseans,
- support livable communities,
- and enhance and encourage the overall economic development of the state through the provision of adequate and essential public infrastructure.

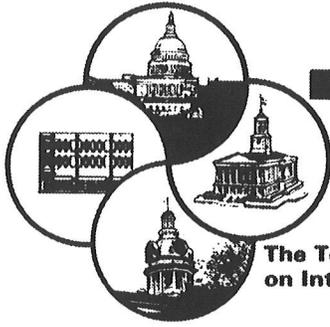
This report represents the staff's continuing efforts to improve the inventory.

Information from the annual inventory is being used for local planning and community and economic development grants. In addition, anyone with an interest in infrastructure needs can access this information online at ctasdata.utk.tennessee.edu through a partnership with the University of Tennessee's County Technical Assistance Service. There you can compare counties and different types of infrastructure needs using online mapping services, extract data, and even link to the data.

Sincerely,

Senator Mark Norris
Chairman

Lynnise Roehrich-Patrick
Executive Director



TACIR

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on Intergovernmental Relations



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MEMORANDUM

TO: Commission Members

FROM: *Lynnis*
Lynnis Roehrich-Patrick
Executive Director

DATE: 11 June 2014

SUBJECT: Building Tennessee's Tomorrow, 2014

The Tennessee General Assembly charged the Tennessee Advisory Commission on Intergovernmental Relations (TACIR) in 1996 with developing and maintaining an inventory of public infrastructure needs "in order for the state, municipal and county governments of Tennessee to develop goals, strategies, and programs which would

- improve the quality of life of its citizens,
- support livable communities, and
- enhance and encourage the overall economic development of the state."

Each year since this mandate was created for the Commission, TACIR has worked with the State's nine development districts to compile Tennessee's public infrastructure needs inventory to gather information from state and local officials. The information they provide is analyzed by Commission staff, and an annual report is prepared for the General Assembly.

The current report is submitted for your approval. It is the twelfth in the series and comprises \$38.8 billion in projects reported by state and local officials for the inventory completed in 2013. This most recent inventory includes projects that need to be in some stage of development during the five-year period July 2012 through June 2017. The report includes statewide information by type of project and by level of government, as well as information about the condition and needs of our public schools. The report also includes information about the availability of funding to meet reported needs, and a comparison of county-area needs. County-area information about each type of infrastructure in the inventory, as well as relevant legislation, inventory forms, and a glossary of terms can be found in the appendices to the report.

Building Tennessee's Tomorrow: Anticipating the State's Infrastructure Needs

July 2012 through June 2017

EXECUTIVE SUMMARY

This report is the twelfth in a series on infrastructure that began in the late 1990s. These reports to the General Assembly present Tennessee's public infrastructure needs as reported by local officials, those compiled by the Tennessee Department of Transportation, and those submitted by other state departments and agencies as part of their budget requests to the governor. This report provides two types of information collected during fiscal year 2012-13 and covering the five-year period July 2012 through June 2017: (1) needed infrastructure improvements and (2) the condition of existing public schools. Needs fall into six broad categories. See table 1.

Table 1. Summary of Reported Infrastructure Improvement Needs

Five-year Period July 2012 through June 2017

Category	Five-year Reported Estimated Cost	
Transportation and Utilities	\$ 21,767,009,662	56.0%
Education	7,677,898,721	19.8%
Health, Safety, and Welfare	5,883,470,673	15.1%
Recreation and Culture	1,702,200,925	4.4%
Economic Development	1,256,075,051	3.2%
General Government	554,828,960	1.4%
Grand Total	\$ 38,841,483,992	100.0%

A number of conclusions may be drawn from the information compiled in the inventory:

- The total estimated cost of public infrastructure improvements that need to be started or completed in fiscal years 2012 through 2017 is estimated at \$38.8 billion. This total is \$1.3 billion more than the estimate in last year's report, an increase of 3.5%. See table 2.
- The Transportation and Utilities category is and always has been the single largest category in the inventory. Transportation and Utilities increased \$901 million (4.3%) from last year to \$21.8 billion. Comprising 55.5% of estimated costs for all infrastructure improvements, transportation alone dwarfs all other types of infrastructure needs and continues an upward trend with an

The Tennessee General Assembly charged the Tennessee Advisory Commission on Intergovernmental Relations (TACIR) with developing and maintaining an inventory of infrastructure needs "in order for the state, municipal, and county governments of Tennessee to develop goals, strategies, and programs that would

- improve the quality of life of its citizens,
- support livable communities, and
- enhance and encourage the overall economic development of the state."

Public Chapter 817, Acts of 1996.

Table 2. Comparison of Estimated Cost of Infrastructure Improvement Needs
July 2011 Inventory vs. July 2012 Inventory

Category	Reported Cost			Percent Change
	July 2011 through June 2016	July 2012 through June 2017	Difference	
Transportation and Utilities	\$ 20,865,809,131	\$ 21,767,009,662	\$ 901,200,531	4.3%
Education	7,271,463,459	7,677,898,721	406,435,262	5.6%
Health, Safety, and Welfare	5,941,679,207	5,883,470,673	(58,208,534)	-1.0%
Recreation and Culture	1,704,816,699	1,702,200,925	(2,615,774)	-0.2%
Economic Development	1,232,847,959	1,256,075,051	23,227,092	1.9%
General Government	518,672,149	554,828,960	36,156,811	7.0%
Grand Total	\$ 37,535,288,604	\$ 38,841,483,992	\$ 1,306,195,388	3.5%

increase of \$917 million (4.4%), the largest increase of any type of infrastructure.

- Education is the second largest category and increased \$406 million (5.6%) to \$7.7 billion, mainly because of a \$327 million (8.8%) increase in the cost of improvements needed at the state's public college and university campuses, which now stands at \$4 billion. The estimated cost for improving the state's public school buildings remained flat with a slight increase of \$90 million (2.6%) to \$3.6 billion because there has been a shift from adding new space to improving existing space. Asked about the overall condition of their school buildings, public school officials reported that 93% are in good or better condition.
- Health, Safety, and Welfare, the third largest category in the inventory, decreased by \$58 million (1%) to \$5.9 billion. This decline resulted primarily from decreases in the need for improved water and wastewater infrastructure and public health facilities. Water and wastewater accounts for the largest portion of the Health, Safety, and Welfare category at \$3.9 billion; it decreased by \$104 million (2.6%) from last year. Three other types of infrastructure in this category also had a net decrease in total cost: public health facilities, storm water, and housing. The estimated cost of infrastructure improvements needed for law enforcement, fire protection, and handling solid waste increased.
- The Recreation and Culture category decreased overall by \$2.6 million (0.2%) to \$1.7 billion, even though the estimated cost for recreation infrastructure increased by \$43 million (4.6%). This increase was offset by decreases in community development (\$43 million) and libraries, museums, and historic sites (\$1.8 million).
- The estimated cost of both types of infrastructure in the Economic Development category increased and now totals \$1.3 billion, up by \$23 million (1.9%) since the last inventory. The cost of industrial

sites and parks reported in the inventory increased \$17 million (6.6%) to \$274 million because of new projects. The remaining \$6 million increase in the cost of this category was for business district development, which at \$982 million accounts for more than three-fourths of the category.

- General Government infrastructure improvements—the smallest inventory category—increased by \$36 million (7%) to \$555 million. This category includes only two types of infrastructure: public buildings and other facilities. The estimated cost of public building improvements increased by \$18 million (4.3%) while the need for other facilities such as storage and maintenance facilities was up \$18 million (19%).
- Local officials are confident in obtaining funding for only \$11.6 billion of the \$30.9 billion identified as local needs. Most of that amount, \$11.3 billion, is fully-funded; \$362 million is for needs that are partially funded. That leaves another \$19.3 billion of needs for which funding is not yet available. These figures do not include improvements for which funding information is not collected, including existing schools or those in state agencies' capital budget requests.
- The government that owns infrastructure typically funds the bulk of its cost. For example, local officials report that 86% of the funding for county-owned projects will come from county sources. The same is true of improvements reported in the 2007 inventory that have since been completed—counties paid 88% of the cost of meeting their infrastructure needs. Likewise, cities provided 68% of the funds necessary for improvements they needed in 2007 and have completed since then, and they also expect to provide 70% of the funds for current and future improvements. Special districts paid 82% of the cost of meeting their 2007 infrastructure needs and expect to fund 51% of their current and future costs.
- Infrastructure is built for many reasons: enhancing communities, accommodating population growth, improving public health and safety, supporting economic development, and meeting government mandates. Around two-thirds (65%) of improvements in this inventory are needed for public health and safety, 30% are needed for population growth, 21% are needed for community enhancement, and 20% are needed for economic development, while state and federal mandates only account for 2%. These figures add to more than 100% because there may be more than one reason for any particular project. These percentages are comparable to those for projects completed since 2007: public health and safety (67%), population growth (28%), community enhancement (21%), and state and federal mandates (2%). Economic development is the exception with 11%.
- Infrastructure needs and the ability to meet them vary across the state. To understand the variation in county-level infrastructure

needs and local governments' ability to meet them, TACIR staff analyzed infrastructure needs relative to total population, population gain, and financial resources, including local revenue sources and personal income as a measure of residents' ability to pay taxes. Both the need for infrastructure improvements and improvements that have been completed are closely related to financial resources, population, and population gain or loss but are weakly correlated with population growth rates. Sales tax, one of the local revenue measures, is related to a county's ability to complete infrastructure improvements but is not significantly related to how much infrastructure is needed, perhaps because of where people shop. Many of Tennessee's smaller counties have little retail activity, and consequently, their residents do much of their shopping in other counties, contributing through the sales taxes they pay to the destination county's ability to meet its needs rather than their home county's.

Building Tennessee’s Tomorrow: Anticipating the State’s Infrastructure Needs

July 2012 through June 2017

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Building Tennessee's Tomorrow: Anticipating the State's Infrastructure Needs

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INTRODUCTION

One of the greatest fiscal challenges facing our elected officials is dealing with the nation's aging infrastructure. As the population grows and shifts, new classrooms must be built and equipped to meet our children's needs. As roads and bridges wear out, they must be repaired or replaced to ensure our safety. And as outdated water lines begin to crack and fail, they must be upgraded to carry clean drinking water safely and efficiently. These examples are just a few of the demands confronting state and local officials as they struggle with the daunting task of matching limited funds to seemingly unlimited needs.

Why do we rely on the public sector for roads, bridges, water lines, and schoolhouses instead of looking to the private sector? The private sector does a fine job of providing goods and services when it is possible to monitor and control their use and exclude those who cannot or will not pay an amount sufficient to generate profit. In the interest of general health and safety, excluding users is not always desirable, and profit may not always be possible. Public infrastructure is the answer when the service supported is essential to the common good and the private sector cannot profitably provide it at a price that makes it accessible to all. Therefore, we look to those who represent us in our public institutions to set priorities and find ways to fund them.

Why inventory public infrastructure needs?

The Tennessee General Assembly affirmed the value of public infrastructure in legislation enacted in 1996 when it deemed an inventory of those needs necessary "in order for the state, municipal, and county governments of Tennessee to develop goals, strategies, and programs which would

- improve the quality of life of its citizens,
- support livable communities, and
- enhance and encourage the overall economic development of the state

The Commission relies entirely on state and local officials to evaluate the infrastructure needs of Tennessee's citizens as envisioned by the enabling legislation.

Local officials are encouraged to report their needs as they relate to developing goals, strategies, and programs to improve their communities. They are limited only by the very broad purposes for public infrastructure as prescribed by law.

through the provision of adequate and essential public infrastructure.”¹ The public infrastructure needs inventory on which this report is based was derived from surveys of local officials by staff of the state's nine development districts,² the capital budget requests submitted to the Governor by state officials as part of the annual budget process, and bridge and road needs from project listings provided by state transportation officials. The Commission relies entirely on state and local officials to evaluate the infrastructure needs of Tennessee's citizens as envisioned by the enabling legislation.

What infrastructure is included in the inventory?

For purposes of this report, and based on the direction provided in the public act and common usage, public infrastructure is defined as

capital facilities and land assets under public ownership or operated or maintained for public benefit.

To be included in the inventory, infrastructure projects must not be considered normal or routine maintenance and must involve a capital cost of at least \$50,000.³ This approach, dictated by the public act, is consistent with the characterization of capital projects adopted by the Tennessee General Assembly for its annual budget.

Local officials were asked to describe anticipated needs for the period July 1, 2012, through June 30, 2032, classifying those needs by type of project. State-level needs were derived from capital budget requests. Both state and local officials were also asked to identify the stage of development as of July 1, 2012. The period covered by each inventory was expanded to 20 years in 2000 because of legislation requiring its use by the Commission to monitor implementation of Tennessee's Growth Policy Act.⁴ Plans developed pursuant to that act established growth boundaries for annexation by the state's municipalities. This report focuses on the first five years of the period covered by the inventory.

Within these parameters, local officials are encouraged to report their needs as they relate to developing goals, strategies, and programs to improve their communities. They are limited only by the very broad purposes for public infrastructure as prescribed by law. No independent assessment of need constrains their reporting. In addition, the inventory includes bridge and road needs from project listings provided by state transportation and

¹Chapter 817, Public Acts of 1996. For more information about the enabling legislation, see appendix A.

²For more information on the importance of the inventory to the development districts and local officials, see appendix B.

³School technology infrastructure is included for existing schools regardless of cost in order to provide information related to the technology component of the state's education funding formula.

⁴Chapter 672, Public Acts of 2000.

capital needs identified by state officials and submitted to the governor as part of the annual budget process.

How is the inventory accomplished?

The public infrastructure needs inventory is developed using two separate, but related, inventory forms.⁵ Both forms are used to gather information from local officials about needed infrastructure improvements. The second form is also used to gather information about the condition of existing public school buildings, as well as the cost to meet all facilities mandates at the schools, put them in good condition, and provide adequate technology infrastructure. Information about the need for new public school buildings and for school-system-wide infrastructure improvements is gathered in the first form. TACIR staff provide local officials with supplemental information from the state highway department about transportation needs, many of which originate with local officials. This information helps ensure that all known needs are captured in the inventory.

In addition to gathering information from local officials, TACIR staff incorporate capital improvement requests submitted by state officials to the Governor’s Budget Office into the inventory. While TACIR staff spend considerable time reviewing all the information in the inventory to ensure accuracy and consistency, the information reported in the inventory is based on the judgment of state and local officials. In many cases, information is limited to that included in the capital improvements programs of local governments, which means that it may not fully capture local needs.

Projects included in the inventory are required to be in the conceptual, planning and design, or construction phase at some time during the five-year period July 2012 through June 2017. Projects included are those that need to be either started or completed during that period. Estimated costs for the projects may include amounts spent before July 2012 to start a project that needs to be completed during the five-year period or amounts to be spent after June 2017 to complete a project that needs to be started during the five-year period. Because the source of information from state agencies is their capital budget requests, all of those projects are initially recorded as conceptual.

In the context of the public infrastructure needs inventory, the term “mandate” is defined as *any rule, regulation, or law originating from the federal or state government that affects the cost of a project.*⁶ The mandates most commonly reported are the Americans with Disabilities Act (ADA), asbestos, lead, underground storage tanks, and the Education Improvement Act (EIA). The EIA mandate was to reduce the number of students in each public school classroom by an overall average of about 4½ by fall 2001.

⁵Both forms are included in appendix C.

⁶See the Glossary of Terms at the end of the report.

TACIR staff provide local officials with supplemental information from the state highway department about transportation needs, many of which originate with local officials. This information helps ensure that all known needs are captured in the inventory.

The information reported in the inventory is based on the judgment of state and local officials.

In a time of tight budgets, the annual inventory process is the one opportunity many decision makers have to set funding issues aside for a moment and think proactively and broadly about their infrastructure needs.

The public infrastructure needs inventory provides the basic information that helps state and local officials match needs with funding, especially in the absence of a formal CIP.

Tennessee public schools began working toward that goal with passage of the EIA in 1992 and met it by hiring a sufficient number of teachers.

Except in the case of existing public schools, the inventory does not include estimates of the cost to comply with mandates, only whether the need was the result of a mandate; therefore, mandates themselves are not analyzed here other than to report the number of projects affected by mandates.

How is the inventory used?

The public infrastructure needs inventory is both a product and a continuous process, one that has been useful in

- short-term and long-range planning,
- providing a framework for funding decisions,
- increasing public awareness of infrastructure needs, and
- fostering better communication and collaboration among agencies and decision makers.

The inventory promotes planning and setting priorities.

The public infrastructure needs inventory has become a tool for setting priorities and making informed decisions by all stakeholders. Many decision makers have noted that in a time of tight budgets and crisis-based, reactive decisions, the annual inventory process is the one opportunity they have to set funding issues aside for a moment and think proactively and broadly about their very real infrastructure needs. For most officials in rural areas and in smaller cities, the inventory is the closest thing they have to a capital improvements program (CIP). Without the inventory, they would have little opportunity or incentive to consider their infrastructure needs. Because the inventory is not limited to needs that can be funded in the short term, it may be the only reason they have to consider the long-range benefits of infrastructure.

The inventory helps match critical needs to limited funding opportunities.

The public infrastructure needs inventory provides the basic information that helps state and local officials match needs with funding, especially in the absence of a formal CIP. At the same time, the inventory provides information needed by the development districts to update their respective *Comprehensive Economic Development Strategy Reports*, required annually by the Federal Economic Development Administration. Unless a project is listed in that document, it will not be considered for funding by that agency. Information from the inventory has been used to develop lists of projects suitable for other types of state and federal grants as well. For example, many projects that have received Community Development Block Grants were originally discovered in discussions of infrastructure needs with local

government officials. And it has also helped state decision makers identify gaps between critical needs and available state, local, and federal funding, including an assessment of whether various communities can afford to meet their infrastructure needs or whether some additional planning needs to be done at the state level about how to help them.

The inventory provides an annual review of conditions and needs of public school facilities.

The schools' portion of the inventory is structured so that the condition of all schools is known, not just the ones in need of repair or replacement. Data can be retrieved from the database and analyzed to identify particular needs, such as technology. This information is useful in pinpointing pressing needs for particular schools and districts, as well as providing an overview of statewide needs. This unique, statewide database provides information about the condition and needs of Tennessee's public school facilities.

The inventory increases public awareness and fosters better communication and collaboration among decision makers.

The state's infrastructure needs have been reported to a larger public audience, and the process has fostered better communication between the development districts, local and state officials, and decision makers. The resulting report has become a working document used at the local, state, and regional levels. It gives voice to the often-underserved small towns and rural communities. Each update of the report provides an opportunity for reevaluation and reexamination of projects and for improvements in the quality of the inventory and the report itself. This report is unique in terms of its broad scope and comprehensive nature. Through the inventory process, development districts have expanded their contact, communication, and collaboration with agencies not traditionally sought after (e.g., local boards of education, utility districts, and the Tennessee Department of Transportation) and strengthened personal relationships and trust with their more traditional local and state contacts. Infrastructure needs are being identified, assessed, and addressed locally and documented for the Tennessee General Assembly, various state agencies, and decision makers for further assessment and consideration.

What else needs to be done?

The data collection process continues to improve, and the current inventory is more complete and accurate than ever. The Commission has tried to strike a balance between requiring sufficient information to satisfy the intent of the law and creating an impediment to local officials reporting their needs. By law, the inventory is required of TACIR, but it is not required of state or local officials; they may decline to participate without penalty. Similarly, they may provide only partial information. This can make comparisons across jurisdictions and across time difficult.

Many projects that have received Community Development Block Grants were originally discovered in discussions of infrastructure needs with local government officials.

Each update of this report provides an opportunity for reevaluation and reexamination of projects and for improvements in the quality of the inventory and the report itself.

Information about public infrastructure needs in Tennessee is now available online at ctasdata.utk.tennessee.edu.

But with each annual inventory, participants have become more familiar with the process and more supportive of the program.

Information from the annual inventory is being used for local planning and community and economic development grants. In addition, anyone with an interest in infrastructure needs can access this information online at ctasdata.utk.tennessee.edu through a partnership with the University of Tennessee's County Technical Assistance Service. There you can compare counties and different types of infrastructure needs using online mapping services, extract data, and even link to the data.

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INFRASTRUCTURE NEEDS STATEWIDE

The estimated cost of public infrastructure needed statewide increased slightly to \$38.8 billion.

State and local officials estimate the cost of public infrastructure improvements that need to be in some stage of development between July 1, 2012, and June 30, 2017, at \$38.8 billion, an increase of approximately \$1.3 billion (3.5%) from last year's report (see table 3).⁷ This is the largest amount

Table 3. Comparison of Estimated Cost of Needed Infrastructure Improvements

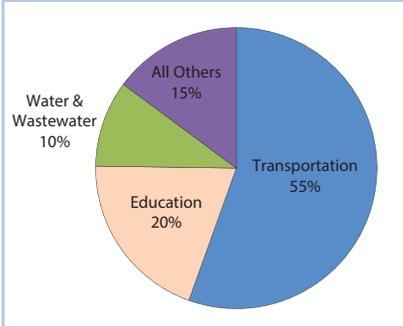
July 2011 Inventory vs. July 2012 Inventory

Category and Type of Need	July 2011 Inventory	July 2012 Inventory	Difference	Percent Change
Transportation and Utilities	\$ 20,865,809,131	\$ 21,767,009,662	\$ 901,200,531	4.3%
Transportation	20,626,268,422	21,543,213,953	916,945,531	4.4%
Other Utilities	226,440,709	211,295,709	(15,145,000)	-6.7%
Telecommunications	13,100,000	12,500,000	(600,000)	-4.6%
Education	\$ 7,271,463,459	\$ 7,677,898,721	\$ 406,435,262	5.6%
Post-secondary Education & Preschools	3,710,190,100	4,036,894,855	326,704,755	8.8%
School Renovations & Replacements*	2,001,594,801	2,055,256,934	53,662,133	2.7%
New Public Schools & Additions	1,496,433,558	1,534,325,932	37,892,374	2.5%
School System-wide	63,245,000	51,421,000	(11,824,000)	-18.7%
Health, Safety, and Welfare	\$ 5,941,679,207	\$ 5,883,470,673	\$ (58,208,534)	-1.0%
Water and Wastewater	3,963,989,570	3,859,873,821	(104,115,749)	-2.6%
Law Enforcement	1,178,436,758	1,297,045,107	118,608,349	10.1%
Public Health Facilities	426,157,900	336,964,500	(89,193,400)	-20.9%
Fire Protection	169,835,678	186,075,132	16,239,454	9.6%
Storm Water	154,941,202	153,340,113	(1,601,089)	-1.0%
Solid Waste	33,518,099	36,172,000	2,653,901	7.9%
Housing	14,800,000	14,000,000	(800,000)	-5.4%
Recreation and Culture	\$ 1,704,816,699	\$ 1,702,200,925	\$ (2,615,774)	-0.2%
Recreation	932,706,629	975,235,657	42,529,028	4.6%
Community Development	455,741,259	412,358,334	(43,382,925)	-9.5%
Libraries, Museums, and Historic Sites	316,368,811	314,606,934	(1,761,877)	-0.6%
Economic Development	\$ 1,232,847,959	\$ 1,256,075,051	\$ 23,227,092	1.9%
Business District Development	975,460,620	981,788,620	6,328,000	0.6%
Industrial Sites and Parks	257,387,339	274,286,431	16,899,092	6.6%
General Government	\$ 518,672,149	\$ 554,828,960	\$ 36,156,811	7.0%
Public Buildings	424,174,200	442,438,106	18,263,906	4.3%
Other Facilities	94,497,949	112,390,854	17,892,905	18.9%
Grand Total	\$ 37,535,288,604	\$ 38,841,483,992	\$ 1,306,195,388	3.5%

*Existing school improvements include technology projects with estimated costs below the \$50,000 threshold used for other infrastructure types analyzed in this inventory. Individual technology projects under the threshold totaled \$4,041,845 in 2012 and \$5,501,526 in 2011.

⁷Totals for the July 2011 inventory have been adjusted because of ongoing data quality control. For complete listings of all needs reported in the July 2012 inventory by county and by public school system, see appendixes D and G.

Figure 1. Percent of Total Reported Cost of Infrastructure Needed by Type of Infrastructure
Five-year Period July 2012 through June 2017



ever reported in the inventory. Transportation, water and wastewater, and education needs continue to dominate the inventory, collectively representing 85% of the total cost reported (see figure 1).

Some transportation and water and wastewater projects are needed to support other types of public infrastructure improvements. When that's the case, those costs are included with the infrastructure they support to show the full cost of that improvement. The same is true for all property acquisition and some storm water, telecommunications, and other utilities improvements. For example, if a rail spur is needed to create a new industrial site, then the rail spur is recorded in the inventory as an industrial site project with transportation as its secondary project type. Similarly, if a sewer line is needed for a new school, then the sewer line is recorded as new school construction with water and wastewater as its secondary type. This dual classification allows more flexibility in analyzing the costs of different types of infrastructure improvements. Those costs are included with the infrastructure they support in table 3 on the previous page and throughout this report except where they are broken out in table 4 below.

Table 4. Comparison of Infrastructure that Supports Direct Service to Private Sector and Infrastructure that Supports Other Public Infrastructure

Five-year Period July 2012 through June 2017

Type of Need	Provide Direct Service to Private Sector		Support Other Public Infrastructure		Project Type Total
	Est. Cost [in millions]	Percent of Total	Est. Cost [in millions]	Percent of Total	Est. Cost [in millions]
Transportation	\$ 21,488.4	99.2%	\$ 164.3	0.8%	\$ 21,652.7
Water and Wastewater	3,859.9	99.1%	36.8	0.9%	3,896.7
Other Utilities	236.3	99.1%	2.1	0.9%	238.4
Storm Water	153.3	85.9%	25.1	14.1%	178.4
Telecommunications	12.5	100.0%	0.0	0.0%	12.5
Property Acquisition	0.0	0.0%	275.7	100.0%	275.7
Grand Total	\$ 25,750.4	98.1%	\$ 504.0	1.9%	\$ 26,254.4

Transportation and Utilities is the single largest category (\$21.8 billion) and increased the most (\$901 million). Transportation alone, at \$21.5 billion, dominates the category and the inventory as a whole and is the only type of infrastructure in this category that increased in cost (see figure 1 and table 3). The \$917 million (4.4%) net increase in transportation costs would have been much larger if not for \$1.5 billion in projects that were completed and \$1.3 billion for projects that decreased in cost or were canceled or postponed. New transportation projects in the inventory totaled \$1.2 billion, and hundreds of projects already in the inventory increased in cost by \$2.4 billion.

The estimated cost of improvements for the other two types of infrastructure in the Transportation and Utilities category both decreased. Other utilities (e.g., electricity and gas) decreased \$15 million (6.7%) to \$211 million mainly because of canceled and completed projects. Telecommunications decreased by \$600,000 (4.6%) to \$12.5 million because a fiber optic project was completed under

budget in Greeneville, and a plan to expand the county communication network to cities in Dickson County was canceled.

The other categories are relatively small compared with Transportation and Utilities. Education is the second largest (\$7.7 billion) and increased \$406 million (5.6%) mainly because the cost of improvements needed at the state's public college and university campuses increased \$327 million (8.8%) to \$4 billion. Proposed new science facilities and energy upgrades are the primary reasons for this increase. The University of Tennessee in Knoxville (UTK) is responsible for almost half of the new cost (\$280 million), including a \$90 million, 200,000-square-foot, multi-disciplinary science lab and a \$45 million, 120,000-square-foot, energy and environmental science and research center at the Institute of Agriculture in Knox County. The UT Health Science Center in Shelby County also needs \$45 million to renovate classrooms and labs, and UT Martin in Weakley County needs \$32 million to renovate and expand engineering classrooms. Finally, Tennessee State University needs \$38 million to modernize its long-term student housing.

The estimated cost of school additions and new public schools has been on a downward trend since 2007, and there has been a shift from adding new space to improving or replacing existing space. The shift from new space to improving existing space is partly the result of a slowing of enrollment growth that began in 2007, coinciding with the economic downturn, and remains low. Even so, the need for both additions and new schools increased slightly since last year, \$38 million (2.5%), to \$1.5 billion mainly because Williamson County needs \$81 million for four new schools. The cost of improvements needed at existing schools, including renovations (\$1.5 billion), replacement schools (\$302 million), technology (\$124 million), and renovations caused by mandates (\$122 million), increased \$54 million (2.7%) to \$2.1 billion—the fourth straight year that the estimated cost for this type of infrastructure improvement has grown. School-system-wide needs for projects like bus garages and central office buildings, which serve entire school systems, decreased \$12 million (18.7%) to \$51 million. The school chapter, presented later in this report, provides more information about infrastructure needs for the state's public schools.

Health, Safety, and Welfare, the third-largest category, decreased \$58 million (1%) to \$5.9 billion. This decline resulted primarily from decreases in the need for improved water and wastewater infrastructure and public health facilities. Water and wastewater accounts for the largest portion of the Health, Safety, and Welfare category at \$3.9 billion; it decreased by \$104 million (2.6%) from last year. Water treatment plant expansions were completed in Shelbyville and Murfreesboro at a cost of \$25 and \$37 million, a sewer treatment plant upgrade was completed in Gallatin at a cost of \$30 million, and the Water and Wastewater Authority of Wilson County completed a water distribution system at a cost of \$20 million. The largest new project was Clarksville's \$71 million wastewater treatment plant, needed to replace the one severely damaged in the 2010 flood.

In 2010, it was estimated that deficiencies in America's surface transportation systems cost households and businesses (including vehicle repairs and operating costs) nearly \$130 billion. If present trends continue, by 2020 the annual costs imposed on the U.S. economy from deteriorating surface transportation will increase to \$210 billion, and by 2040 to \$520 billion.

American Society of Civic Engineers, *Failure to Act: The Economic Impact of Current Investment Trends in Surface Transportation Infrastructure*, 2013, pg 17.

http://www.asce.org/uploadedFiles/Infrastructure/Failure_to_Act/Failure_to_Act_Report.pdf

The American Water Works Association indicated that the 237,600 water line breaks each year in the U.S. cost public water utilities approximately \$2.8 billion annually. Further, aging, leaky pipes steal 7 billion gallons each day from our water systems, according to the American Society of Civil Engineers.

Jesse Berst, *Water World Magazine*, "Patching Up the Pipes: How Smart Technologies Help Cities Prevent Leaks and Save Money," July 2014, Vol. 30, Issue 7.
<http://www.waterworld.com/articles/print/volume-30/issue-7/editorial-features/patching-up-the-pipes-how-smart-technologies-help-cities-prevent-leaks-and-save-money.html>

The estimated cost for public health facilities declined \$89 million (21%) to \$337 million because of postponed and completed projects. The Tennessee Department of Intellectual and Developmental Disabilities postponed \$47 million in facilities and upgrades because of changes in their facilities master plan. Out of \$34 million in completed projects, the two largest were the \$8.5 million Woodbine Clinic in Nashville and the \$8.4 million regional health facility in Putnam County.

Storm water infrastructure and public housing also contributed to the decrease in the Health, Safety, and Welfare category. Storm water improvements declined \$1.6 million (1%) to \$153 million mainly because of four completed projects totaling \$7.5 million. The two largest were drainage mitigation projects in Clarksville (\$3.7 million) and Madisonville (\$3.5 million). The cost of public housing improvements fell by \$800,000 (5.4%) to \$14 million. No new housing infrastructure needs were reported; two projects were completed in Carter and Grundy counties totaling \$793,000.

The decrease in cost for Health, Safety, and Welfare projects would have been larger if not for increases in law enforcement, fire protection, and solid waste infrastructure. Although law enforcement needs, including prisons, jails, justice centers, and police stations, declined in each of the last three inventories, they increased \$119 million (10.1%) to \$1.3 billion this year because the five-year reporting period now includes a \$198 million women's prison in East Tennessee. Infrastructure needed for fire protection (e.g., emergency communications systems, sprinkler systems, and fire stations) increased \$16 million (9.6%) to \$186 million. This increase was mainly caused by new projects totaling \$25 million. In addition, the estimated cost of six fire protection projects grew by a combined \$14 million. Infrastructure needed to handle solid waste increased \$2.7 million (8%) to \$36 million because Smith and White counties now need to expand their landfills.

The Recreation and Culture category decreased only slightly this year, \$2.6 million (0.2%) to \$1.7 billion, because increases in cost of recreation infrastructure partially offset decreases in the other two types of infrastructure in this category, community development and libraries, museums, and historic sites. The cost of recreational infrastructure improvements reported in the inventory increased almost \$43 million (4.6%) to \$975 million because of new projects. The three largest projects are Gatlinburg's Rocky Top Sports Arena (\$22 million), a new soccer complex in Clarksville (\$15 million), and East Tennessee State University's proposed renovation of the multi-purpose Memorial Center Arena, also known as the "Mini-Dome" (\$12 million).

The estimated cost of infrastructure improvements for community development declined by more than \$43 million (9.5%) to \$412 million because of a combination of completed projects, postponed projects, and decreases in estimates for projects already in the inventory. The largest

project completed was a \$15 million community center in Johnson City. Similarly, the estimated cost of infrastructure improvements for libraries, museums, and historic sites decreased by \$1.8 million (0.6%) to \$315 million because of completed needs. Goodlettsville’s newly finished \$6 million library by itself represented 62% of the \$9.7 million in completed needs for libraries, museums, and historic sites in this year’s inventory.

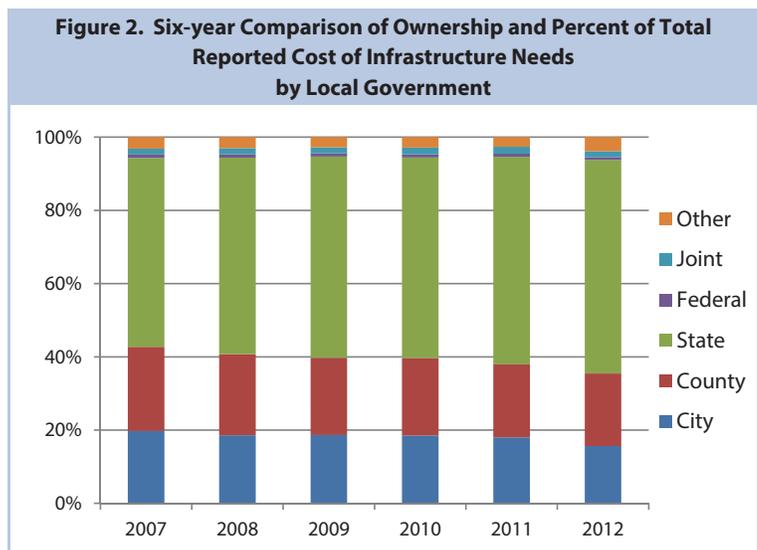
The estimated cost of both types of infrastructure in the Economic Development category increased and now totals \$1.3 billion, up by \$23 million (1.9%) since the last inventory. The cost of industrial sites and parks reported in the inventory increased \$17 million (6.6%) to \$274 million because of new projects, including a new \$10 million park in Sevier County and a \$15 million park in Fairview with a greenway between the industrial and commercial complexes. The remaining \$6 million increase in the cost of this category was for business district development, which at \$982 million accounts for more than three-fourths of the Economic Development category. The largest increase was in the estimated cost of the Putnam County business park (\$5 million). The second-largest increase was \$1.5 million for phase 2 of Erwin City’s downtown historic district renovation. The overall increase in business district development would have been larger if not for a canceled \$2 million plan to redevelop a neglected commercial space in Maury County.

At \$555 million, General Government is the smallest category, but it increased by the third-largest amount, \$36 million (7%) since the last inventory. This category includes only two types of infrastructure: public buildings (\$442 million) and other facilities that do not fit the definition of a more specific type of infrastructure, (e.g., \$112 million for storage and maintenance facilities). The estimated cost of new or improved public buildings increased \$18 million (4.3%) and includes \$120 million to renovate and upgrade state buildings in Davidson County. Infrastructure improvements needed for other facilities increased \$18 million (18.9%), including a new \$12 million armory in Warren County. Shelby and Davidson counties also need a combined \$10 million to renovate and expand state veteran cemeteries.

State infrastructure improvements continue to dominate overall, and county improvements continue to exceed those of cities.

State agencies own or will own more than half of all public infrastructure in the inventory (58.3%); their share of the total cost of needed improvements has been increasing (see figure 2). The largest portion of seven of the twenty-one types (transportation; post-secondary education and preschools; school-system-wide needs; law enforcement; public buildings; public health facilities; and libraries, museums, and historic sites) belong to the state. Slightly more than three-fourths (78%) of transportation infrastructure improvements are the responsibility of the state.

Nearly all improvements needed for post-secondary education and preschool infrastructure (99.8%) belong to the state’s public colleges and universities. In fact, these im-

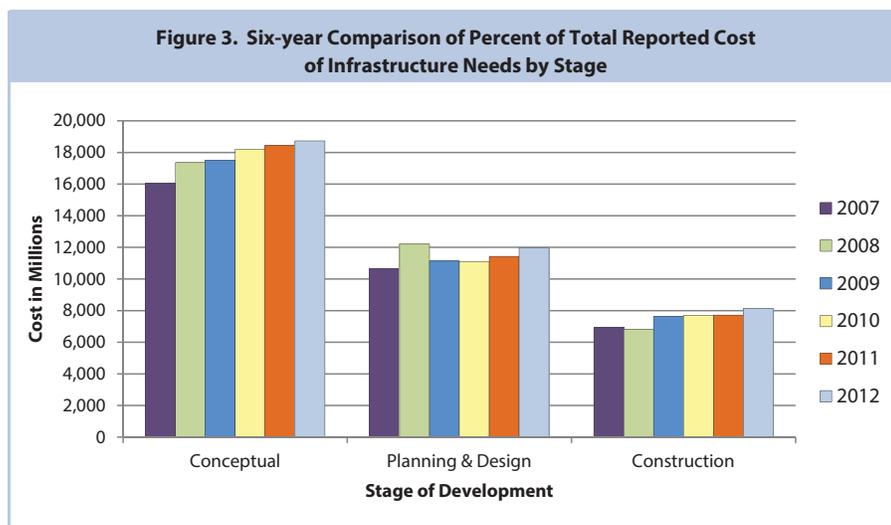


provements, combined with transportation, comprise the bulk of state-owned infrastructure in the inventory, accounting for \$20.8 billion of the \$22.6 billion total reported for state government. The next largest areas of state responsibility are law enforcement and public health facilities. As shown in table 5, state needs exceed half of the totals for both of these types of infrastructure even though the dollar amounts are relatively small. The state's share of law enforcement costs is 66.3% (\$860.1 million) and the state's share of public health facilities is 90.9% (\$306.3 million). When transportation projects are excluded from total costs, ownership is more evenly distributed across cities (22.2%), counties (33.4%), and the state (33.7%), with 1.9% in joint ownership, 8.6% owned by other types of governmental entities such as utility districts, and only a tiny fraction (0.1%) in federal ownership.

At the local level, infrastructure needed by counties slightly exceeds what is needed by cities. Counties' improvements make up over 83.6% of the Economic Development category because of the new convention center in Nashville. The convention center accounts for 71.7% of the estimated cost for business district development and 56% of the total for the entire Economic Development category.⁸ The convention center is treated as a county need because it was reported by a metropolitan government.⁹ Besides economic development, counties are also responsible for most of the new school and addition construction (92.3%), solid waste (77.8%), and school renovations and replacements (74.5%).

On the other hand, cities' needs make up the largest portion of the Recreation and Culture category (55.4%); the General Government category (44.4%); and the Health, Safety, and Welfare category (38.6%). Cities need most of the infrastructure in eight of the twenty-one project types in the inventory. Around half of the water and wastewater infrastructure (48.6%) in the inventory will belong to cities, as will all public housing, nearly all storm water (92.8%), most other utilities (74.7%), community development (74.7%), other facilities (70.9%), fire protection (66.3%), and recreation (54.5%) infrastructure. Cities will also own 37.7% of public building improvements.

The estimated cost of infrastructure improvements in all three stages of development continues to trend upward.



The overall distribution of infrastructure by stage—conceptual, planning and design, and construction—has remained consistent over the past six years with upward trends in the estimated cost of infrastructure improvements in all three (see figure 3). Projects in the conceptual stage make up

⁸The Nashville convention center was completed in the spring of 2013 but this report only includes completions as of July 1, 2012.

⁹Metropolitan governments have the characteristics of incorporated places and remain administrative divisions of the state with all the responsibilities of counties. For that reason, they are treated as county governments in the inventory.

Table 5. Total Estimated Cost in Millions and Percent of Total of Needed Infrastructure Improvements by Project Type and Level of Government
Five-year Period July 2012 through June 2017

	City	County	State	Federal	Joint	Other	Total
Category and Type of Need	Estimated Cost [in millions]	Percent of Total	Estimated Cost [in millions]	Percent of Total	Estimated Cost [in millions]	Percent of Total	Estimated Cost [in millions]
Transportation and Utilities	\$ 2,402.8	11.0%	\$ 16,805.4	77.2%	\$ 309.4	\$ 18.6	\$ 21,767.0
Transportation	2,245.1	10.4%	16,798.3	78.0%	303.4	0.0	21,543.2
Other Utilities	157.7	74.7%	7.1	3.4%	6.0	18.6	211.3
Telecommunications	0.0	0.0%	0.0	0.0%	0.0	0.0	12.5
Education	\$ 77.7	1.0%	\$ 4,075.8	53.1%	\$ 0.0	\$ 566.6	\$ 7,677.9
Post-secondary Education & Preschools	1.7	0.0%	4,030.2	99.8%	0.0	0.0	4,036.9
School Renovations & Replacements	54.7	2.7%	0.0	0.0%	0.0	469.1	2,055.3
New Public Schools & Additions	21.0	1.4%	0.0	0.0%	0.0	96.8	1,534.3
School System-wide	0.2	0.4%	45.6	88.7%	0.0	0.8	51.4
Health, Safety, and Welfare	\$ 2,273.8	38.6%	\$ 1,180.8	20.1%	\$ 202.2	\$ 898.8	\$ 5,883.5
Water and Wastewater	1,877.7	48.6%	0.6	0.0%	188.4	898.8	3,859.9
Law Enforcement	107.3	8.3%	860.1	66.3%	0.0	0.0	1,297.0
Public Health Facilities	1.6	0.5%	306.3	90.9%	12.0	0.0	337.0
Fire Protection	123.4	66.3%	12.7	6.8%	0.3	0.0	186.1
Storm Water	142.3	92.8%	1.2	0.8%	0.8	0.0	153.3
Solid Waste	7.4	20.5%	0.0	0.0%	0.6	0.0	36.2
Housing	14.0	100.0%	0.0	0.0%	0.0	0.0	14.0
Recreation and Culture	\$ 943.8	55.4%	\$ 370.8	21.8%	\$ 60.0	\$ 1.5	\$ 1,702.2
Recreation	531.1	54.5%	198.3	20.3%	40.4	1.5	975.2
Community Development	308.2	74.7%	22.3	5.4%	12.7	0.0	412.4
Libraries, Museums, and Historic Sites	104.5	33.2%	150.2	47.7%	6.9	0.0	314.6
Economic Development	\$ 141.8	11.3%	\$ 4.7	0.4%	\$ 54.2	\$ 5.5	\$ 1,256.1
Business District Development	81.3	8.3%	0.0	0.0%	19.4	0.0	981.8
Industrial Sites and Parks	60.6	22.1%	4.7	1.7%	34.8	5.5	274.3
General Government	\$ 246.3	44.4%	\$ 198.7	35.8%	\$ 1.6	\$ 0.0	\$ 554.8
Public Buildings	166.7	37.7%	187.5	42.4%	0.0	0.0	442.4
Other Facilities	79.7	70.9%	11.2	10.0%	1.6	0.0	112.4
Grand Total	\$ 6,086.2	15.7%	\$ 22,636.2	58.3%	\$ 627.5	\$ 1,491.0	\$ 38,841.5
				0.8%			3.8%
							100.0%

nearly half (48.2%) of all reported needs in this year’s inventory. Improvements in the planning and design phase increased only slightly (from \$11.4 billion to \$12 billion). Improvements under construction also increased by a small amount (from \$7.7 billion to nearly \$8 billion). See figure 4. Even though the Nashville convention center has since been completed, it was still under construction in 2012 and therefore makes up most of the estimated cost of infrastructure in the construction phase in the Economic Development category. Infrastructure in the conceptual stage continues to dominate five of the six major categories except Economic Development. See table 6.

Infrastructure in the Education category remains mostly conceptual because some new and rather expensive needs offset the cost of projects moving forward into more advanced stages of development. The large increase in post-secondary education and preschool needs contributed to this shift. Last year, \$4.3 billion in projects were in the conceptual stage compared to \$4.8 billion this year, while the construction stage increased \$415 million since last year to a total of \$1.8 billion. See table 6.

State and federal mandates affect 4.8% of all projects.

Commission staff do not ask local or state officials to identify costs related to state and federal mandates—except for infrastructure at existing schools—because officials reporting their needs often do not have the detailed information necessary to separate those costs out from total project costs (e.g., the cost of ramps and lowered water fountains required by the Americans with Disabilities Act or ADA). They are asked, however, to indicate if the costs of any projects are affected by mandates. While it is impossible to determine how much of the estimated total costs are associated with state and federal mandates, it is possible to determine the overall number of projects that mandates affect. It is a relatively small portion (4.8%) of the total in this inventory. The long-term trend in the number of projects that mandates affect has been flat since the 2002 inventory (see figure 5). School renovations and replacements alone account for over half (58.2%) of the total and are far more likely to be affected by mandates than any other type of project. See table 7.

Figure 4. Percent of Total Reported Cost of Infrastructure Needs by Stage of Development
Five-year Period July 2012 through June 2017

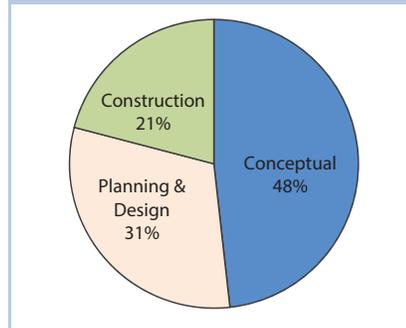


Figure 5. Number of Projects Affected by Mandates
2002 through 2012

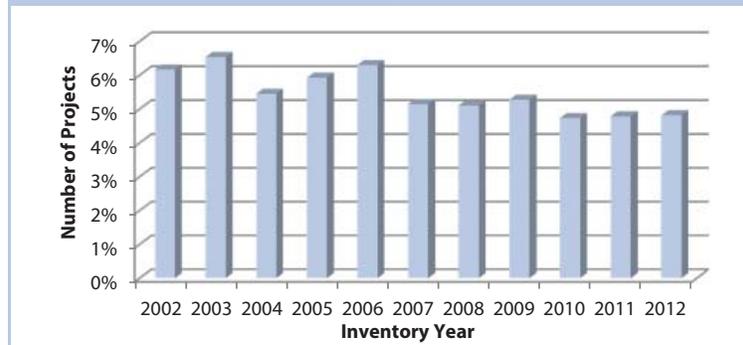


Table 7. Percent of Projects Affected by Mandates
Five-year Period July 2012 through June 2017

Type of Need	Number of Projects or Schools Reported	Projects or Schools Affected by Mandates	
		Number	Percent
School Renovations & Replacements	1,246	254	20.4%
Post-secondary Education & Preschools	517	49	9.5%
Transportation	4,149	42	1.0%
Recreation	620	31	5.0%
Water and Wastewater	1,195	22	1.8%
Law Enforcement	174	7	4.0%
Public Buildings	176	7	4.0%
Fire Protection	114	7	6.1%
Public Health Facilities	51	6	11.8%
Libraries, Museums, and Historic Sites	94	3	3.2%
Community Development	84	3	3.6%
New Public Schools & Additions	250	2	0.8%
School System-wide	17	1	5.9%
Solid Waste	36	1	2.8%
Storm Water	62	1	1.6%
Housing	1	0	0.0%
Business District Development	35	0	0.0%
Industrial Sites and Parks	106	0	0.0%
Other Facilities	53	0	0.0%
Other Utilities	71	0	0.0%
Telecommunications	4	0	0.0%
Grand Total	9,055	436	4.8%

Note: The project count includes all projects at a school. A school can have more than one project and those projects can be in different stages.

Building Tennessee’s Tomorrow: Anticipating the State’s Infrastructure Needs

July 2012 through June 2017

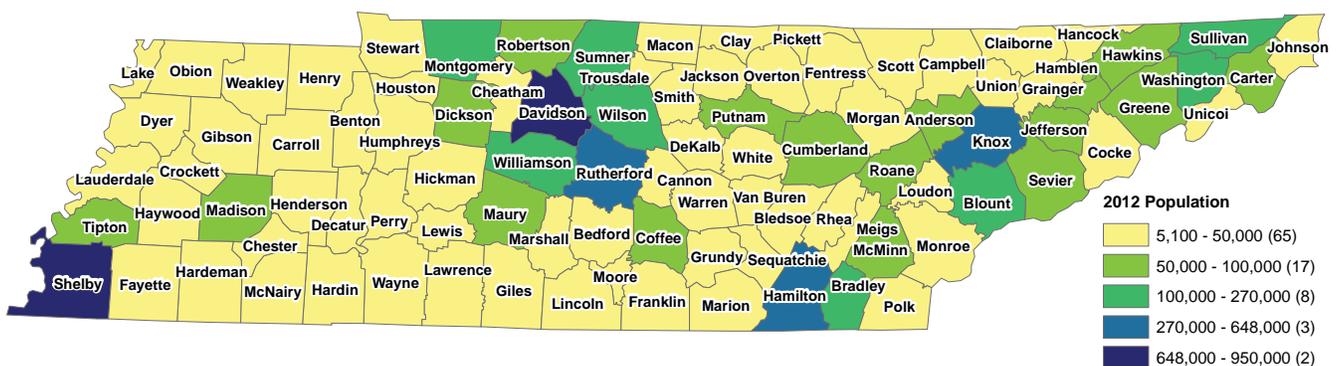
INFRASTRUCTURE NEEDS BY COUNTY

Infrastructure needs vary widely across Tennessee’s counties.

Public infrastructure needs and the ability to meet them vary across Tennessee. Unsurprisingly, those counties with the largest populations, population growth, and tax bases need the most infrastructure and are consistently able to build the most. Local governments reported \$15.5 billion in infrastructure needs.¹⁰ Shelby, Davidson, and Rutherford, three of the most populous counties in the state (see map 1), are among the six with the greatest infrastructure needs (indicated by dark blue in map 2). Shelby and Davidson, the 1st and 2nd most populous counties, need the most, nearly one-third (\$4.6 billion) of the \$15.5 billion. The 3rd and 4th most populous counties—Knox and Hamilton—are missing from the top six. They rank 8th and 9th for infrastructure needs and are shaded in light blue in map 2. The 5th through 7th most populous counties—Rutherford, Williamson, and Montgomery—plus Washington, the 10th most populous county, comprise the remainder of the top six for infrastructure needs.

Not only do the most populous counties need the most, they also complete the most. Nine of the ten most populous counties (shaded blue in map 3) are among the twelve that completed the most infrastructure improvements since the 2007 inventory. Nine are also among the ten with the largest property and sales tax bases, which may account for their ability to meet their infrastructure needs. Seven of the twelve that completed the most infrastructure are among the top ten counties for all three of these measures, population, and both tax base measures: Shelby, Davidson, Knox, Rutherford, Williamson, Sullivan, and Montgomery. See appendix E for infrastructure improvements completed since 2007.

Map 1. Tennessee—2012 Population Estimates
Total Population by County

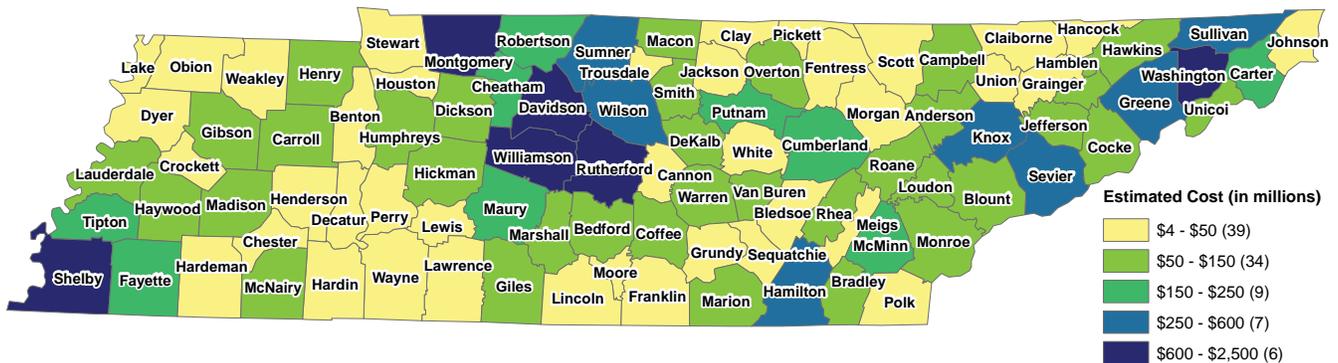


¹⁰There are another \$23.3 billion in regional needs across the state.

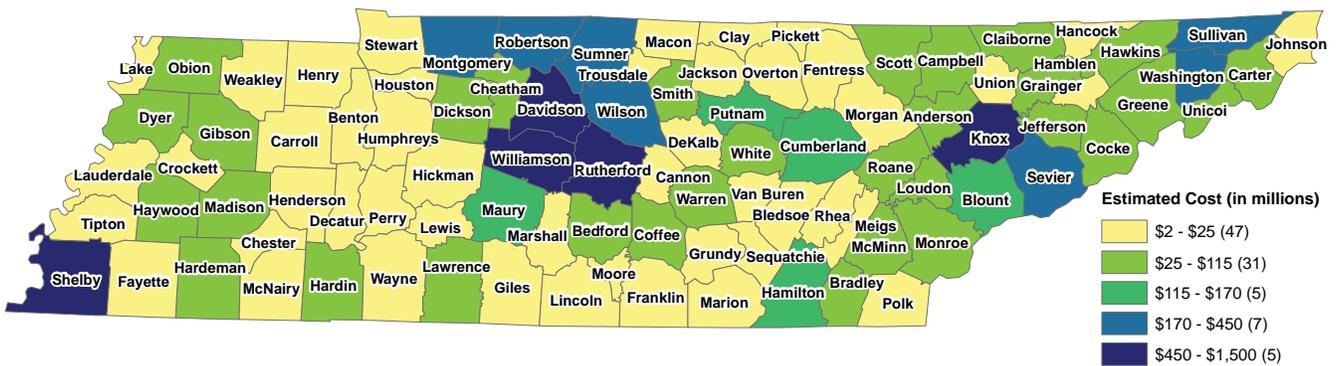
Hamilton, 4th in population and tax bases, ranks 14th for infrastructure improvements since 2007 and is shaded green in map 3. Sumner, 8th in population and for infrastructure improvements since 2007, is among the top ten for property tax base but not for sales tax base. Washington, 10th in population and for infrastructure improvements, is among the top ten for sales but not for property. Sevier, home to Gatlinburg and Pigeon Forge, is one of the twelve that completed the most infrastructure improvements and has the 7th largest sales tax base and the 9th largest property tax base in the state but only the 15th largest population. Wilson, the 12th largest county, is the only county among the twelve completing the most infrastructure that is not among the ten with the largest property and sales tax bases. Robertson, the smallest county in the group of 12 that completed the most infrastructure (a \$21 million jail expansion and a \$35 million high school), is not among the ten largest nor is it among the ten with the largest tax bases. See appendix F for property and sales tax base information for the 95 counties.

Four other counties fall into the same range on map 3 as Hamilton: Blount, Putnam, Cumberland, and Maury, in order of infrastructure improvements completed since 2007. None of them are in the top ten for population or tax bases, but Blount is 11th for population and property and 13th for sales. Putnam is the 18th largest county and ranks 15th for sales and 22nd for property. Cumberland is the smallest of these, ranking 24th for population, 22nd for sales, and 20th for property. Maury is the 16th largest county and has the 17th largest sales and property tax bases.

Map 2. Estimated Cost of Total Infrastructure Needs
Five-year Period July 2012 through June 2017



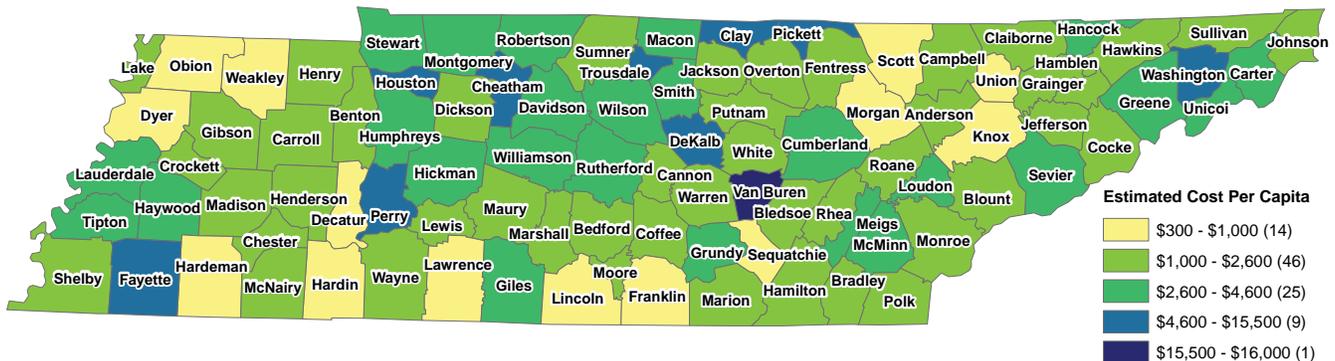
Map 3. Estimated Cost of Completed Infrastructure Needs
Infrastructure Needs Reported July 1, 2007, and Completed by July 1, 2012



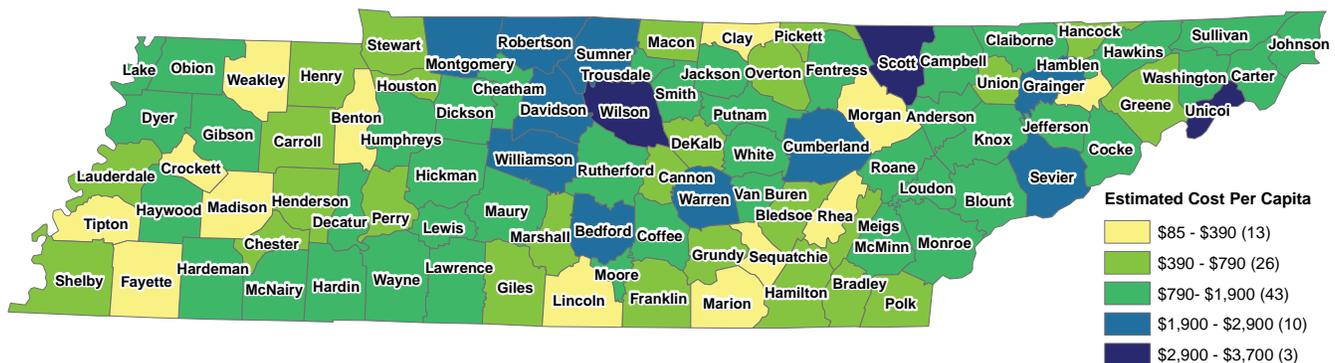
For example, Greene is light blue in map 2 but light green in map 3 and needs an average amount of infrastructure but completed much less than average. Greene has needed \$30 million for a sewer system since 2004. Fayette and Tipton are dark green in map 2 but yellow in map 3. These two counties have needs from 2007 that have not yet been met. Tipton needs \$17 million for a new high school and Fayette needs \$12 million to replace Jefferson and Somerville elementary schools.

Although the largest counties generally need the most infrastructure and get the most done and smaller counties need less overall and get less done, smaller counties may need just as much or more relative to their population. It turns out that when you examine needs per capita, most of the counties with the highest needs per capita, shaded blue in map 4, have small populations. Washington is the lone exception with a population of 125,000. Cheatham and Fayette have populations close to 40,000, DeKalb is close to 20,000, while the other six—Houston, Perry, Clay, Trousdale, Van Buren, and Pickett—have populations less than 10,000. The state’s smallest county, Pickett, with a population of only 5,100, has needed a new high school for eight years now, estimated to cost a relatively modest \$15 million. The state’s second smallest county, Van Buren, with a population of only 5,628, needs \$25 million to install and replace water lines. Needs of this size would not be significant in a county with a large population like Shelby or Davidson, but they are big enough to cause these small counties to have the largest infrastructure needs per capita. Van Buren is first in per capita needs, and Pickett is second.

**Map 4. Estimated Cost of Total Infrastructure Needs Per Capita
Five-year Period July 2012 through June 2017**



**Map 5. Estimated Cost of Completed Infrastructure Needs Per Capita
Infrastructure Needs Reported July 1, 2007, and Completed by July 1, 2012**



The counties completing the most infrastructure improvements per capita fall mainly into two groups: small counties where one large project was completed and counties where a lot of work is being done. There is no obvious pattern looking at completed needs per capita. The thirteen counties across the state with greatest completed needs per capita, shaded in blue on map 5, include counties with both large and small populations. Wilson, Scott, and Unicoi, shaded in dark blue, are 12th, 63rd, and 70th for population. Davidson, Williamson, Montgomery, and Sumner, shaded in light blue, are 2nd and 6th through 8th for population, but the other light blue counties—Sevier, Robertson, Cumberland, Bedford, Warren, and Grainger—have populations that rank from 15th to 60th.

So what factors might explain the variation in needed and completed infrastructure among counties that size does not? Likely candidates include population growth and wealth. Wealth in this instance means revenue sources for local governments and residents’ ability to pay taxes based on their income.

Both population and wealth factors are strongly tied to infrastructure needs and the ability to meet them.

Statistical analysis can suggest explanations for things that general observation cannot. We looked at each of the factors using the simple statistical method of measuring correlations. Correlation coefficients measure the strength of the relationship between two sets of numbers. The strength is reported as a range from zero to one. The coefficient will be positive if one set of numbers increases as the other increases, or decreases as the other decreases; it will be negative if one increases as the other decreases. Because Tennessee’s 95 counties vary so much in size—for instance, “Big Shelby” at 755 square miles, is almost seven times the size of Trousdale, which is only 114 square miles—we divided the factors by square miles to make sure that land area did not distort the analysis.

Table 8. Correlation Between Needed Infrastructure and Related Factors Divided by Land Area

Factor per square mile	Correlation with reported needs per square mile
Income	0.92
Taxable Property	0.91
Taxable Sales	0.89
Population	0.88
Population Gain or Loss	0.86
Population Growth Rate	0.46

Table 9. Correlation Between Completed Infrastructure Needs and Related Factors Divided by Land Area

Factor per square mile	Correlation with completed needs per square mile
Taxable Property	0.91
Taxable Sales	0.90
Income	0.88
Population	0.84
Population Gain or Loss	0.74
Population Growth Rate	0.27

When analyzed in isolation, five factors stand out, both in relation to need and the ability to meet needs. Wealth factors come first, then population. Population gain or loss comes next, but growth rates are only weakly correlated. Population growth rates get a lot of attention, but the population gain or loss is a much better indicator of a county’s infrastructure needs. Population growth rate has been the factor with the lowest coefficient for the last three reports. See tables 8 and 9.

Population plays the strongest role in explaining infrastructure needs and completions.

While correlation allows comparison of two factors at a time, regression analysis allows you to compare a group of factors. Two regressions were performed—one examining factors as they relate to infrastructure needs and a second examining factors as they relate to completions. We found that population was the most significant factor in explaining infrastructure needs, followed by income and taxable property. Population gain was also significant but taxable sales were not. See Table 10.

Table 10. Significance of Factors Affecting Infrastructure Needs

Statistical Significance	Factors in Order of Significance				
	Population	Income	Taxable Property	Population Gain or Loss	Taxable Sales
Highly Significant	X	X	X	X	
Significant					
Not Significant					X

Note: All variables were divided by land area.

Population was also the most significant factor explaining a county’s ability to meet its needs. Population gain, taxable property, and taxable sales followed in order of decreasing significance. In contrast to needs, income is not as significant to completing infrastructure needs. See table 11. People and businesses shopping in a county other than the one in which they live or are located may explain why sales is significant for completions but not for needs. By shopping out of county, they contribute to the destination county’s ability to meet its needs rather than their home county. Income is highly significant for needs but not for completions, possibly because property and sales are taxed by local governments but income is not.

Table 11. Significance of Factors Affecting Infrastructure Completed Needs

Statistical Significance	Factors in Order of Significance				
	Population	Population Gain or Loss	Taxable Property	Taxable Sales	Income
Highly Significant	X	X	X	X	
Significant					X
Not Significant					

Note: All variables were divided by land area.

Building Tennessee's Tomorrow: Anticipating the State's Infrastructure Needs

July 2012 through June 2017

FUNDING THE STATE'S INFRASTRUCTURE NEEDS

Nearly two-thirds of the funding needed for infrastructure in the current inventory is not yet available.

Only 38% of the funds needed to pay for public infrastructure is currently available. The inventory does not include information about whether funding is available for the estimated \$7.8 billion worth of improvements at existing schools (including additions) and for those drawn from the capital budget requests submitted by state agencies. Excluding the cost of that infrastructure from the \$38.8 billion total reported for the period covered by the report leaves \$31 billion in needs. Of that \$31 billion, only \$11.3 billion worth of infrastructure needs are fully funded. No funding is available for \$19.3 billion of that amount, but \$362 million is available for the \$4.4 billion worth of improvements that are partially funded. See tables 12 and 13.

Last year's report was the first to include information about funding for completed projects and why they were needed. This year's report builds on that analysis, adding another year of information, providing a full five years of information about infrastructure improvement needs first reported in the 2007 inventory.

The government that owns infrastructure typically funds the bulk of its cost. For example, local officials report that 86% of the funding for county-owned projects will come from county sources. The same is true of improvements reported in the 2007 inventory that have since been completed—counties paid 88% of the cost of meeting their infrastructure needs. Likewise, cities provided 68% of the funds necessary for improvements they needed in 2007 and have completed since then, and they also expect to provide 70% of the funds for current and future improvements. Special districts paid 82% of the cost of meeting their 2007 infrastructure needs and expect to fund 51% of their current and future costs.

Local officials report that \$11.6 billion is available to fund public infrastructure; of that amount \$11.3 billion is for infrastructure that is fully funded.

Table 12. Summary of Funding Availability*
Five-year Period July 2012 through June 2017

	Funding Available [in billions]	Funding Needed [in billions]	Total Needs [in billions]
Fully Funded Needs	\$ 11.3	\$ 0.0	\$ 11.3
Partially Funded Needs	0.4	4.0	4.4
Unfunded Needs	0.0	15.3	15.3
Total	\$ 11.6	\$ 19.3	\$ 30.9

*Excludes infrastructure improvements for which funding availability is not known.
Note: Totals may not equal 100% because of rounding.

Infrastructure is built for many reasons: enhancing communities, accommodating population growth, improving public health and safety, supporting economic development, and meeting government mandates. Around two-thirds (65%) of unmet infrastructure needs in this inventory would improve public health and safety, 30% would accommodate population growth, and 21% would enhance communities (see figure 6). These percentages add to more than 100% because there may be more than one reason for any particular project. These percentages are comparable to those for projects completed since 2007: public health and safety (69%),

Table 13. Percent of Needs Fully Funded by Type of Need

Five-year Period July 2012 through June 2017

Category and Project Type	Total Needs [in millions]	Fully Funded Needs [in millions]	Percent of Total Needs
Transportation and Utilities	\$ 21,684.4	\$ 7,542.5	34.8%
Transportation	21,467.8	7,480.9	34.8%
Other Utilities	204.2	60.9	29.8%
Telecommunications	12.5	0.7	5.6%
Health, Safety, and Welfare	\$ 4,703.6	\$ 1,893.0	40.2%
Water and Wastewater	3,859.3	1,639.9	42.5%
Law Enforcement	437.9	100.1	22.9%
Fire Protection	173.4	34.1	19.7%
Storm Water	152.2	83.2	54.7%
Solid Waste	36.2	9.2	25.4%
Public Health Facilities	30.7	12.5	40.9%
Housing	14.0	14.0	100.0%
Education	\$ 1,542.3	\$ 319.9	20.7%
New Public Schools*	1,517.7	309.5	20.4%
School System-wide	14.9	10.2	68.3%
Post-secondary Education & Preschools	9.7	0.2	2.3%
Recreation and Culture	\$ 1,363.7	\$ 425.2	31.2%
Recreation	792.1	267.4	33.8%
Community Development	403.4	118.0	29.2%
Libraries, Museums, and Historic Sites	168.2	39.8	23.7%
Economic Development	\$ 1,256.1	\$ 975.7	77.7%
Business District Development	981.8	928.3	94.6%
Industrial Sites and Parks	274.3	47.3	17.3%
General Government	\$ 356.4	\$ 121.0	34.0%
Public Buildings	255.0	93.1	36.5%
Other Facilities	101.4	28.0	27.6%
Grand Total	\$ 30,906.5	\$ 11,277.3	36.5%

* Includes replacement of existing schools.

The long-term sustainability of the gas tax is being threatened by two unrelated issues: a shrinking tax base and a shrinking tax rate.

Carl Davis, *State Tax Notes*, "Pay-Per-Mile Tax is Only a Partial Solution," Volume 72, Number 7, May 19, 2014.

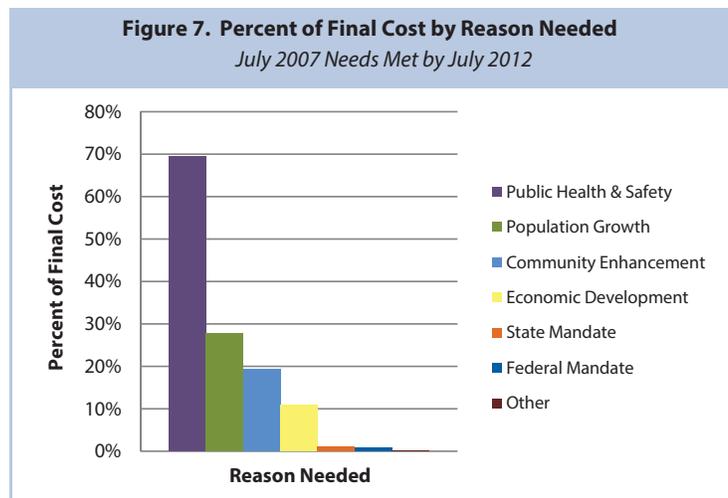
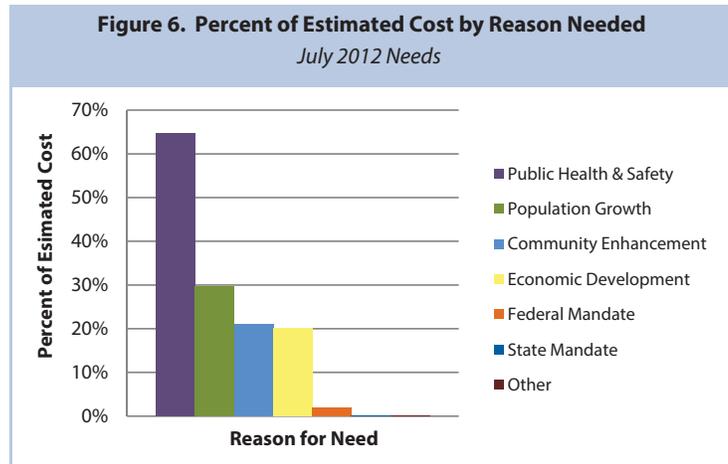
population growth (28%), and community enhancement (19%). See figure 7.

In some cases, government mandates ensure that necessary infrastructure is funded and completed. As noted in the first chapter, few projects are affected by mandates, but one type of infrastructure—public school buildings—is needed to meet Tennessee’s constitutional requirement to provide a system of free public schools to all students.¹¹ That mandate places a requirement on the state to fund schools, which it does through the Basic Education Program (BEP) formula. The formula includes money for capital outlay—an amount that tops \$700 million this year, of which the state pays around half. Although the state makes a substantial contribution to funding public schools, they are owned by local governments.

Reasons, ownership, and funding sources vary by type of infrastructure.

Population growth is given as a reason for nearly all (98%) new and fully funded public school infrastructure reported in the 2012 inventory and for 84% of new school infrastructure completed between 2008 and 2012. Half (51%) of the new public school infrastructure needs reported in 2007 have been met (see table 14). Schools completed between 2008 and 2012 were mainly funded by counties, which own 86% of this new public school infrastructure. Cities are the second largest owners of new public schools at 11%, and special school districts are third at 3.4%. Currently, local officials report that \$1.5 billion is needed for new public school infrastructure, of which \$310 million is fully funded. Although the state provides considerable funding for school capital outlay, it does not earmark those funds for that specific purpose. School systems have the flexibility to use those funds to meet various school needs and generally report using them for operating costs.

Public health and safety is the main reason given for transportation infrastructure, accounting for 71% of improvements in the 2012 inventory and 78% of improvements made since 2007 (see tables 15 and 16). Consequently, several dedicated funding mechanisms, including the federal and state fuel taxes and local wheel taxes, help ensure that transportation infrastructure needs are met. In recent years, federal fuel tax revenue has been insufficient to pay Highway Trust Fund commitments to states. Congress has transferred money into the federal Highway Trust Fund for seven years to avoid



¹¹ Article 11, Section 12 of the Tennessee State Constitution, recognizing the inherent value of education and encouraging its support, directs the General Assembly to provide for the maintenance, support, and eligibility standards of a system of free public schools.

Table 14. Percent of July 2007 Needs Completed by Type of Need
Infrastructure Needs Reported July 1, 2007, and Completed by July 1, 2012

Category and Project Type	July 2007 Inventory	Total Completions	Completion Rate	Percent of Total
Transportation and Utilities	\$ 17,414,430,630	\$ 3,786,123,477	21.7%	51.5%
Transportation	16,818,744,164	3,345,811,874	19.9%	45.5%
Other Utilities	578,277,566	429,952,703	74.4%	5.9%
Telecommunications	17,408,900	10,358,900	59.5%	0.1%
Health, Safety, and Welfare	\$ 5,155,221,465	\$ 1,889,926,328	36.7%	25.7%
Water and Wastewater	3,759,747,476	1,269,753,134	33.8%	17.3%
Law Enforcement	739,903,580	388,567,033	52.5%	5.3%
Storm Water	264,425,356	60,455,204	22.9%	0.8%
Fire Protection	209,019,045	60,042,949	28.7%	0.8%
Housing	71,788,740	47,599,740	66.3%	0.6%
Public Health Facilities	57,403,268	42,196,268	73.5%	0.6%
Solid Waste	52,934,000	21,312,000	40.3%	0.3%
Education	\$ 1,862,839,839	\$ 943,066,318	50.6%	12.8%
New Public Schools*	1,783,181,339	912,840,318	51.2%	12.4%
School System-wide	44,112,000	18,182,000	41.2%	0.2%
Post-secondary Education & Preschools	35,546,500	12,044,000	33.9%	0.2%
Recreation and Culture	\$ 1,484,320,256	\$ 398,530,597	26.8%	5.4%
Recreation	905,349,132	295,516,418	32.6%	4.0%
Community Development	421,268,405	41,986,522	10.0%	0.6%
Libraries, Museums, and Historic Sites	157,702,719	61,027,657	38.7%	0.8%
Economic Development	\$ 566,293,020	\$ 125,606,900	22.2%	1.7%
Business District Development	343,616,020	62,207,900	18.1%	0.8%
Industrial Sites and Parks	222,677,000	63,399,000	28.5%	0.9%
General Government	\$ 500,329,874	\$ 202,658,036	40.5%	2.8%
Public Buildings	460,387,874	180,088,036	39.1%	2.5%
Other Facilities	39,942,000	22,570,000	56.5%	0.3%
Grand Total	\$26,983,435,084	\$ 7,345,911,656	27.2%	100%

* Includes replacements of existing schools.

reducing funding to all states, but the resulting uncertainty in funding makes it difficult for states to plan. If federal funds were reduced, the Tennessee Department of Transportation (TDOT) would likely abandon some new construction in favor of maintenance.

Transportation accounts for 69% (\$21 billion) of all infrastructure costs for which funding information is available, 66% of the improvements that are fully funded, and 46% of the cost of total completions. The majority of transportation infrastructure needs completed since the 2007 inventory were state-owned (73%); 68% of the funding for those improvements was state revenue, and 28% was federal revenue. Local governments owned the remainder of the projects. Cities own 15% of the transportation infrastructure completed since 2007 and funded about half (52%); most of the remaining funding came from state (15%) and federal (30%) sources. Counties own 11% of the

Table 15. Reasons Given for Needing Infrastructure Improvements in the Current Inventory
Five-year Period July 2012 through June 2017

Category and Type of Infrastructure	July 2012 Estimated Cost	Reason for Infrastructure Need					
		Public Health & Safety	Population Growth	Community Enhancement	Economic Development	Federal and State Mandates	Other Reasons
Transportation and Utilities	\$ 21,684,439,662	71.0%	28.1%	12.7%	20.2%	1.4%	0.0%
Transportation	21,467,753,953	71.3%	28.1%	12.4%	20.2%	1.4%	0.0%
Other Utilities	204,185,709	30.7%	38.4%	48.8%	20.0%	0.0%	0.0%
Telecommunications	12,500,000	60.0%	0.0%	5.6%	40.0%	0.0%	0.0%
Health, Safety, and Welfare	\$ 4,703,633,950	89.6%	27.9%	25.1%	9.7%	0.9%	0.5%
Water and Wastewater	3,859,293,821	88.0%	29.8%	25.3%	10.9%	0.9%	0.5%
Law Enforcement	437,932,084	100.0%	23.9%	29.7%	0.2%	0.0%	0.0%
Fire Protection	173,385,132	100.0%	24.7%	6.1%	0.9%	0.3%	0.0%
Storm Water	152,180,113	94.2%	0.5%	24.1%	13.1%	0.0%	0.0%
Solid Waste	36,172,000	86.2%	35.8%	19.5%	4.2%	1.4%	11.1%
Public Health Facilities	30,670,800	100.0%	2.8%	28.7%	3.3%	24.5%	0.8%
Housing	14,000,000	0.0%	0.0%	100.0%	100.0%	0.0%	0.0%
Education	\$ 1,542,254,760	4.5%	96.6%	4.1%	3.6%	1.3%	2.1%
New Public Schools*	1,517,678,760	4.2%	98.0%	3.5%	3.1%	1.4%	2.1%
School System-wide	14,871,000	40.0%	6.3%	61.2%	0.0%	0.0%	0.0%
Post-secondary Education & Preschools	9,705,000	0.0%	15.5%	7.3%	82.2%	0.0%	0.0%
Recreation and Culture	\$ 1,363,707,369	14.6%	9.6%	93.7%	16.7%	1.4%	0.0%
Recreation	792,095,541	22.0%	9.8%	93.0%	5.3%	1.1%	0.0%
Community Development	403,398,334	4.6%	8.5%	95.1%	40.2%	0.0%	0.0%
Libraries, Museums, and Historic Sites	168,213,494	3.2%	11.7%	93.4%	14.3%	6.4%	0.1%
Economic Development	\$ 1,256,075,051	0.9%	4.1%	79.1%	85.0%	2.4%	0.0%
Business District Development	981,788,620	0.1%	0.9%	95.1%	82.3%	2.0%	0.0%
Industrial Sites and Parks	274,286,431	3.7%	15.9%	22.1%	94.6%	3.8%	0.0%
General Government	\$ 356,371,756	32.8%	31.5%	62.3%	10.1%	3.2%	0.0%
Public Buildings	254,983,202	39.1%	36.7%	57.6%	9.1%	1.7%	0.0%
Other Facilities	101,388,554	16.9%	18.6%	74.4%	12.5%	6.9%	0.0%
Grand Total	\$ 30,906,482,548	64.7%	29.8%	21.0%	20.2%	2.0%	0.1%

* Includes replacements of existing schools.

Table 16. Reasons Given for Needing Infrastructure Improvements Completed Since 2007
Infrastructure Needs Reported July 1, 2007, and Completed by July 1, 2012

Category and Type of Infrastructure	July 2007 Completions 2008-12	Reason for Infrastructure Need					
		Public Health & Safety	Population Growth	Community Enhancement	Economic Development	Federal and State Mandates	Other Reasons
Transportation and Utilities	\$ 3,786,123,477	79.8%	15.9%	14.3%	12.1%	0.2%	0.0%
Transportation	3,345,811,874	77.9%	17.5%	16.1%	13.4%	0.2%	0.0%
Other Utilities	429,952,703	95.5%	3.8%	0.7%	1.4%	0.0%	0.0%
Telecommunications	10,358,900	68.1%	0.0%	0.0%	31.9%	0.0%	0.0%
Health, Safety, and Welfare	\$ 1,889,926,328	88.9%	28.2%	15.0%	5.9%	3.6%	0.2%
Water and Wastewater	1,269,753,134	87.1%	31.1%	12.7%	7.7%	3.3%	0.1%
Law Enforcement	388,567,033	100.0%	27.5%	14.0%	0.0%	6.2%	0.0%
Storm Water	60,455,204	98.3%	3.6%	5.1%	3.3%	0.4%	3.3%
Fire Protection	60,042,949	100.0%	25.6%	18.9%	0.7%	3.5%	0.0%
Housing	47,599,740	23.3%	24.4%	98.9%	22.3%	0.0%	0.0%
Public Health Facilities	42,196,268	100.0%	0.8%	0.0%	0.0%	0.0%	0.0%
Solid Waste	21,312,000	65.8%	14.2%	26.6%	4.2%	0.0%	0.0%
Education	\$ 943,066,318	9.0%	82.6%	26.4%	2.1%	6.5%	0.8%
New Public Schools*	912,840,318	8.0%	83.5%	26.2%	1.9%	6.7%	0.8%
School System-wide	18,182,000	37.9%	63.5%	33.7%	0.0%	1.6%	2.2%
Post-secondary Education & Preschools	12,044,000	34.9%	45.1%	31.6%	23.2%	0.0%	0.0%
Recreation and Culture	\$ 398,530,597	12.8%	9.8%	93.1%	6.8%	0.5%	0.0%
Recreation	295,516,418	15.9%	9.8%	93.6%	3.7%	0.6%	0.0%
Libraries, Museums, and Historic Sites	61,027,657	0.2%	16.5%	89.6%	5.7%	0.0%	0.0%
Community Development	41,986,522	9.5%	0.5%	94.4%	30.7%	0.0%	0.0%
Economic Development	\$ 125,606,900	2.3%	27.9%	19.9%	82.3%	0.0%	0.0%
Industrial Sites and Parks	63,399,000	4.5%	0.0%	4.7%	98.7%	0.0%	0.0%
Business District Development	62,207,900	0.0%	56.3%	35.5%	65.6%	0.0%	0.0%
General Government	\$ 202,658,036	52.2%	24.7%	25.7%	23.6%	6.3%	0.0%
Public Buildings	180,088,036	54.7%	19.3%	28.5%	26.6%	7.1%	0.0%
Other Facilities	22,570,000	31.9%	67.7%	3.7%	0.0%	0.0%	0.0%
Grand Total	\$ 7,345,911,656	67.4%	27.7%	20.7%	10.5%	2.0%	0.2%

* Includes replacements of existing schools.

transportation infrastructure completed since 2007 and funded about 53%; most of the rest of the funding came from state (14%) and federal sources (32%).

Water and wastewater infrastructure is needed to ensure clean drinking water and protect water supply sources. Consequently, public health and safety was the main reason given for 88% of the estimated cost of improvements reported in the 2012 inventory, as well as 87% of improvements completed between 2008 and 2012. The utilities that provide these services are required to be self-sustaining, funded mainly by user fees rather than through taxes, so that the amount each customer pays is in proportion to the amount that customer uses. Water and wastewater projects made up 17% (\$1.3 billion) of the total dollars needed for all 2007 projects completed since then and had a completion rate of 34%. Half of the water and wastewater infrastructure improvements completed since 2007 belong to cities, which paid for 73% of the cost of their improvements, and 17% of the improvements are owned by counties, which paid 91% of their costs. The remaining 28% is owned by utility districts, which paid 80% of the cost of their infrastructure improvements. Although they don't own any of this infrastructure, the state and federal governments contributed 19% of the funding necessary to complete it.

Storm water infrastructure is also necessary to protect our drinking water and control flooding, and the reason given most often for needing it is public health and safety (94%). Although the need for it grows as the amount of land covered by impervious surfaces (e.g., buildings, roads and streets, and parking lots) increases, population growth is rarely mentioned as a reason for needing it (0.5% of all storm water improvements in the current inventory and 3.6% of the 2007 improvements that have been completed). Counties provide some storm water infrastructure, but 90% of the fully funded improvements in the current inventory are owned by cities, and 93% of the cost of completed projects were paid for by cities. A total of \$152 million is needed for storm water infrastructure in the current inventory, of which \$83 million is available. Only 23% (\$60 million) of the storm water improvements needed in 2007 have been completed. Storm water infrastructure is primarily funded with general tax revenue and, to a lesser extent, with user fees.

Public health and safety was the reason given for 31% of other utility infrastructure—infrastructure owned by public gas and electric utilities—in the current inventory, but for 96% of the improvements completed since 2007. In contrast, population growth and community enhancement were more often given as reasons for other utility infrastructure needs in the current inventory (38% and 49%) than for those needs completed since 2007 (4% and 0.7%). Economic development is given as a reason for 20% of the improvements in the current inventory but only 1% of the improvements completed since 2007. Of the \$578 million worth of other utility infrastructure needs reported in 2007, 74% has been completed. A single project in Nashville, owned by the metropolitan government,

The Environmental Protection Agency says the capital needs of water utilities over 20 years amount to \$384 billion to keep tap water clean and another \$298 billion to address wastewater and runoff. By comparison, over the last 25 years, the E.P.A.'s primary wastewater grant and loan program distributed over \$100 billion, a fraction of the investment the nation needs to make now.

David S. Beckman, *New York Times*, "The Threats to Our Drinking Water," August. 6, 2014.

The Highway Trust Fund is running broke because it is funded by one of the few taxes in the federal government that is denominated in a dollar amount rather than a percentage, and is not indexed for inflation. Since it was set at 18.4 cents per gallon in 1993, it has lost nearly half its value and would have to be raised to 30 cents now just to have the same purchasing power that 18.4 cents had more than two decades ago.

USA Today Editorial Board, *The Leaf Chronicle*, "House Plan on Highways Irresponsible," July 15, 2014.
<http://www.theleafchronicle.com/article/20140716/OPINION/307160008/GUEST-EDITORIAL-House-plan-highways-irresponsible>

accounts for more than two-thirds of the 2007 total and 94% of the cost of improvements completed since then. All of the county costs were paid for by the counties themselves, mainly from user fees. Cities own just 5% of other utility infrastructure and paid 97% of the cost of their own.

Public health and safety is the main reason given for all fire protection infrastructure, but population growth is also given as a reason for 25% of it. Although community enhancement is given as a reason for only 6% of the fire protection improvements in the current inventory, it is given as a reason for nearly 19% of improvements completed since 2007. Local officials report that \$173 million is needed for the fire protection infrastructure in the current inventory and that around one-fifth of that cost (\$34 million) is funded. Only 29% (\$60 million) of the fire protection infrastructure needed in 2007 has been completed. Almost two-thirds (62%) of fire protection infrastructure improvements completed since 2007 belong to cities, which paid 91% of the cost of their improvements, and 38% of the improvements are owned by counties, which paid 96% of their costs.

As with fire protection, public health and safety is the main reason given for all law enforcement infrastructure. Population growth is also given as a reason for 24% of law enforcement infrastructure. Community enhancement is given as a reason for 30% of the law enforcement improvements in the current inventory and about 14% of improvements completed since 2007. Local officials report that \$438 million is needed for the law enforcement infrastructure improvements in the current inventory and that \$100 million of this cost is funded. Approximately 53% (\$389 million) of the law enforcement infrastructure needed in 2007 has been completed. Counties own 86% of the law enforcement infrastructure improvements made since 2007 and paid nearly all (99%) the cost of that infrastructure; 14% is owned by cities, which paid 100% of their costs. Like fire protection infrastructure, law enforcement infrastructure is funded with general tax revenue.

Public buildings, mainly including county courthouses, county offices, city halls, and public works offices, serve a variety of purposes and are needed for many reasons. The public building improvements in the current inventory are needed largely for community enhancement (58%) and public health and safety (39%) but also for population growth (37%). A very small percentage (9%) is needed for economic development. Improvements that have been completed since 2007 were needed mainly for public health and safety (55%) but also for community enhancement (29%) and economic development (27%), and to a lesser extent for population growth (19%). About \$255 million is needed for public building infrastructure in the current inventory, and \$93 million of this cost is funded, mostly with general tax revenue. More than one-third (\$180 million) of the public building improvements needed in 2007 have been completed. Approximately 61% of those belong to counties, which paid nearly their entire cost (97%), and 37% of them are owned by cities, which paid 91% of their cost.

Community enhancement is the reason given most often (95%) for business district development infrastructure in the current inventory, but only for 35% of the improvements completed since 2007. Not surprisingly, economic development is often the reason for needing this type of infrastructure (82% in the current inventory and 66% for those improvements completed since 2007). While population growth is listed as a reason for only 1% of the business district improvements in the current inventory, it is listed as a reason for over half (56%) of those completed since 2007. Of the \$982 million needed for business district infrastructure in the current inventory, 95% (\$928 million) is funded, and nearly all of it belongs to counties. Most of this is for the new convention center and the adjacent art district redevelopment area in Nashville, which together cost an estimated \$854 million and are included as county infrastructure because they are owned by a metropolitan government. About one-fifth (\$62 million) of the business district infrastructure needed in 2007 has been completed. Nearly all (95%) of the \$62 million worth of business district infrastructure improvements completed since 2007 belong to counties, which paid 63% of the cost of their improvements. Three-quarters of this belongs to Metropolitan Nashville and Davidson County. Most of the remainder of county costs (33%) was funded by the federal government.

Economic development is the main reason for nearly all industrial sites and parks infrastructure (95% of improvements in the current inventory and 99% of those completed). Community enhancement and population growth are reasons given for 22% and 16% of industrial sites and parks in the current inventory. Community enhancement was given as a reason for only 5% of industrial site and park improvements completed since 2007; population growth was not given as a reason for any of this new infrastructure. These projects can be complex with multiple components, such as roads, rail spurs, ports, and utilities that are classified as other types of infrastructure (e.g., transportation and water and wastewater) and have different funding sources. Rail spurs and ports are typically funded with state or federal grants; utilities are typically funded with user fees. Only 17% (\$47 million) of the \$274 million needed for industrial site and park infrastructure in the current inventory is fully funded. Slightly over 28% (\$63 million) of the industrial site and park improvements needed in 2007 have been completed. Approximately 66% of industrial site and park improvements completed since 2007 belong to counties, which paid 53% of the cost of their improvements. Federal and state sources, such as the state departments of transportation and of economic and community development, paid 44% of the cost of counties' improvements. About 23% of the improvements are owned by cities, which paid 54% of their costs. The state paid about a quarter of the cost of these, and special districts paid 15% of cities' costs, mainly for water or wastewater infrastructure.

Community enhancement is the reason given for nearly all (93%) new recreation infrastructure in the current inventory and nearly all (94%) improvements completed since 2007. About 34% (\$267 million) of the \$792 million worth of recreation infrastructure is fully funded, mainly

The gap between what it would cost to properly maintain and upgrade America's infrastructure and what governments currently spend is vast.

Charles Chieppo, *Governing*, "How Technology Can Stretch Infrastructure Dollars," July 9, 2014.

<http://www.governing.com/blogs/bfc/col-infrastructure-maintenance-cost-south-carolina-bridge-monitoring.html>

by general tax revenue. About 33% (\$296 million) of the recreation improvements needed in 2007 have been completed. When looking at the 2007 completions, 57% were owned by cities and 36% were owned by counties. Cities paid 62% of their costs and counties paid 72% of theirs. The rest of the funding came from state and federal agencies, with federal agencies paying 20% of the cost of city-owned improvements and 18% of the cost of county-owned improvements. The state paid the other 13% for cities and 2% for counties.

The current inventory includes only one housing project; two were completed in 2012. Community enhancement is given as a reason for all three of these projects, and economic development is given for the one in Memphis, which is the only housing need in the current inventory. Community enhancement was the main reason for nearly all (99%) of the housing improvements made since 2007. Population growth, public health and safety, and economic development were reasons for 24%, 23%, and 22% of those improvements. Of the \$72 million in housing improvement needs reported in 2007, 66% has been completed. Cities own 62% of this housing and paid 47% of the cost; federal and private grants shared the rest of the cost about equally. The federal government paid nearly all (99%) of the cost of county-owned housing improvements, which accounted for the remaining 38% of this public infrastructure.

Building Tennessee's Tomorrow: Anticipating the State's Infrastructure Needs

July 2012 through June 2017

PUBLIC SCHOOL INFRASTRUCTURE NEEDS

Estimated cost of public school building improvements remains steady.

Tennessee's 136 public school systems need \$3.6 billion for infrastructure improvements that are forecast to be in some stage of development during the five-year period July 2012 through June 2017, a slight increase since last year (\$90 million). See table 17. Improvements for the state's public school systems include both new space, entirely new schools and additions to existing schools, and improvements in existing school facilities. These costs have been relatively flat overall since 2007 except for a slight dip in 2009. See figure 8.

Although the need for additions and new schools has been on a downward trend since 2007, the need for both increased slightly since last year, \$26 million (2.2%) for new schools and \$12 million (3.9%) for additions. The estimated cost for renovations increased \$99 million (7%), and the cost to replace existing schools increased \$2.6 million (1%). Not all types of school infrastructure needs increased since last year: the estimated cost of technology infrastructure improvements continues a seven-year downward trend, decreasing \$44 million (26%) in the current inventory; the cost of meeting state and federal mandates also decreased (\$3 million, 2.6%); and the cost for improvements needed for such things as bus garages and central office buildings, which serve entire school systems, have been on a downward trend since 2009 and decreased by around \$1.5 million (21%) since last year.

While the total cost of school infrastructure has been flat since 2007, there has been a shift from adding new

Table 17. Change in School Infrastructure Needs by Type of Need

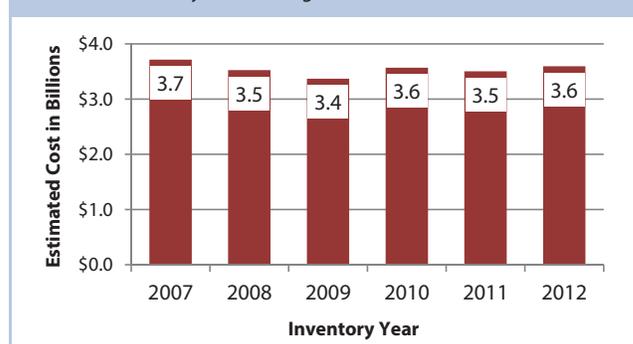
July 2011 Inventory Compared to July 2012 Inventory

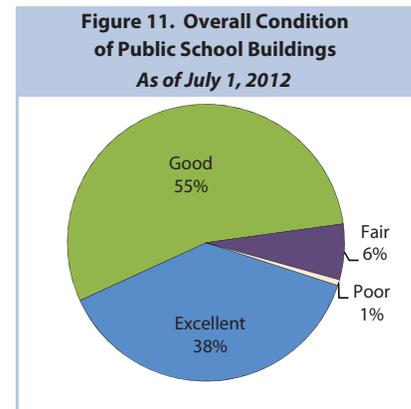
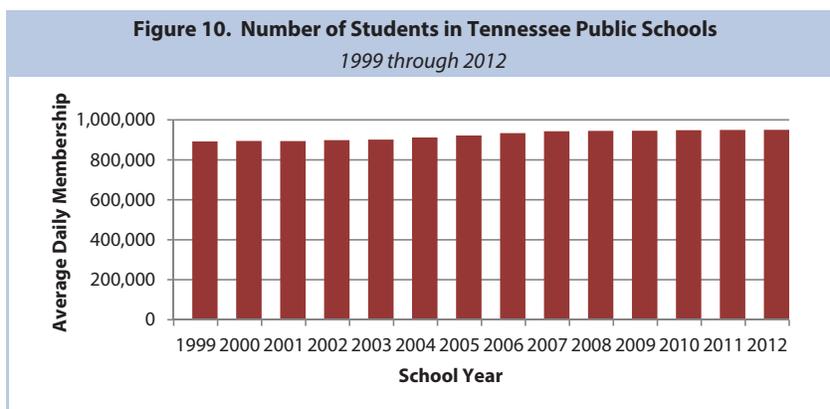
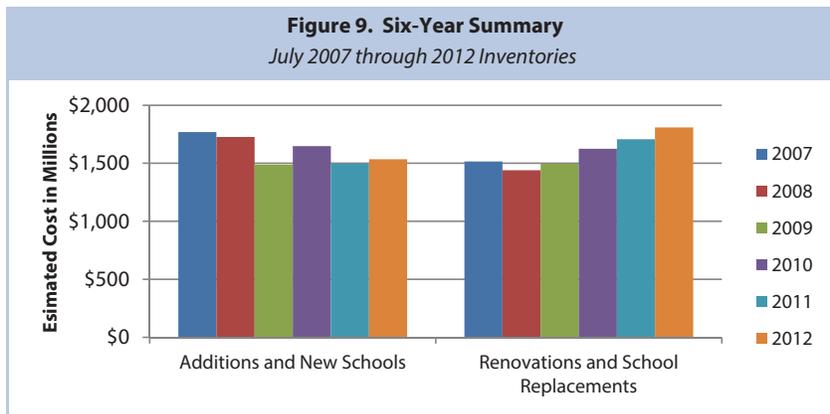
Type of Need	July 2011 Inventory	July 2012 Inventory	Difference	Percent Change
New School Space	\$1,496,433,558	\$1,534,325,932	\$37,892,374	2.5%
New Schools	1,189,623,206	1,215,598,360	25,975,154	2.2%
Additions	306,810,352	318,727,572	11,917,220	3.9%
Improvements to Existing Schools	\$2,001,594,801	\$2,055,256,934	\$53,662,133	2.7%
Renovations	1,408,085,208	1,506,750,565	98,665,357	7.0%
Replacement Schools	299,515,400	302,080,400	2,565,000	0.9%
Technology*	168,466,477	124,119,761	(44,346,716)	-26.3%
Mandates	125,527,716	122,306,208	(3,221,508)	-2.6%
System-wide Needs	\$ 7,333,000	\$ 5,791,000	\$ (1,542,000)	-21.0%
Statewide Total	\$3,505,361,359	\$3,595,373,866	\$90,012,507	2.6%

*Technology includes projects with estimated costs below the \$50,000 threshold used for other infrastructure types analyzed in this inventory. Individual technology projects under the threshold totaled \$4,041,845 in 2012 and \$5,501,526 in 2011.

Figure 8. Total School Infrastructure Needs

July 2007 through 2012 Inventories





space to improving existing space in Tennessee's schools (see figure 9). This shift is partly the result of a slowing of enrollment growth that began in 2007, coinciding with the economic downturn, and remains low (see figure 10). With this change, local officials are reporting higher costs to renovate or replace existing schools; an average of \$4.9 million per school for the 127 (7%) schools in fair or poor condition. Improvements in existing facilities are typically related to the condition of schools, which overall is better now than it was in the initial years of this inventory. However, schools in good or better condition have significant needs, with parts of the school requiring renovation or replacement. See figure 11 for overall condition of public school buildings.

The need for new public schools and additions increased slightly after declining last year.

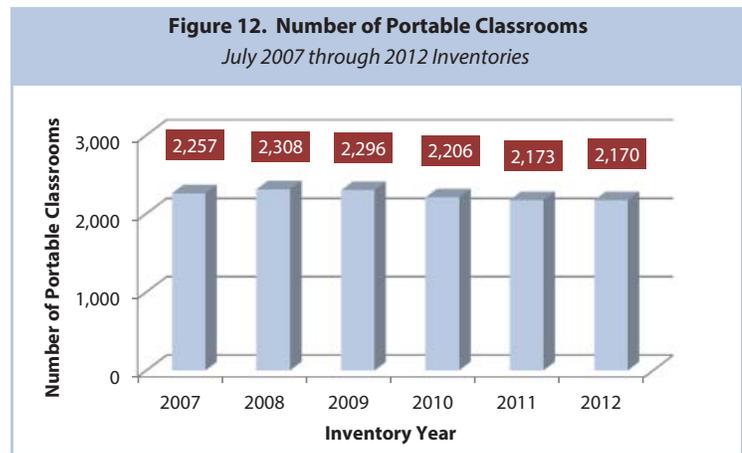
Although several new schools were added to the inventory, the net increase since last year in the estimated cost of new schools was small (\$26 million, 2.2%) and now totals \$1.2 billion, an average of \$21 million per school. Local officials increased their estimates by \$47 million for the cost to build nine of the new schools in last year's inventory that have not been completed. They also added another ten new schools to the inventory, totaling \$196 million. These increases were more than offset by the cost of schools that were completed, canceled, or reduced in size or scope, which totaled \$217 million. This included \$119 million for completing eight new schools, \$27 million for three canceled schools, and \$4 million in cost reductions.

Likewise, the net increase in estimated cost for additions was small, \$12 million, and now totals \$319 million spread across 191 schools in 70 school systems, an average of \$1.7 million per school. Additions added to this inventory total \$36 million and were partially offset by \$24 million in

cancelled or completed additions. The largest net increase for additions (\$6.7 million) was in Montgomery County, most of which was for classrooms at four schools at a combined cost of \$5.5 million. The second-largest net increase (\$6.3 million) was in Williamson County and included a gym at a middle school, 12 classrooms at an elementary school, and increases in the estimated cost of new auditoriums at four middle schools. Fourteen other school systems added additions for 18 schools to the inventory. Hamblen County added \$6.3 million to the inventory for 16 classrooms at Morristown West High School, and Davidson County added \$3.7 million to the inventory for 12 additional classrooms at William Henry Oliver Middle School. The remaining 12 systems are both large and small with combined needs totaling less than \$15 million.

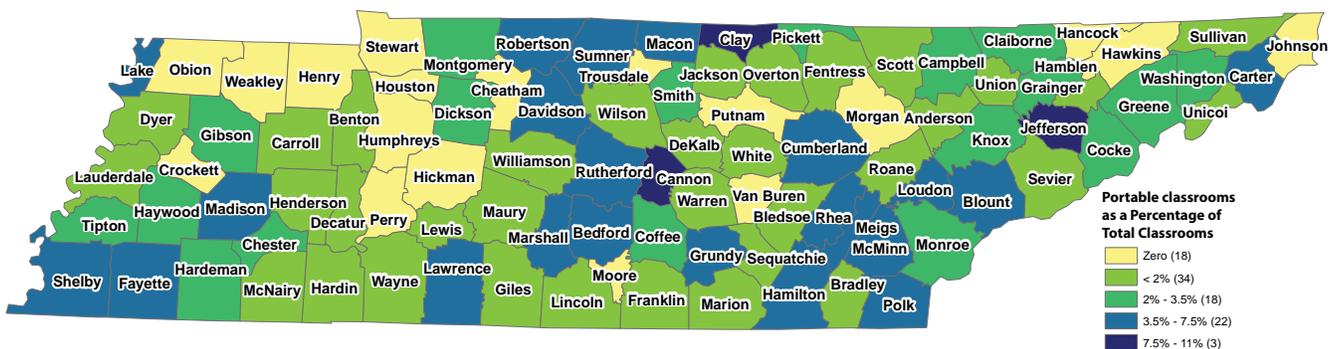
The number of portables at Tennessee’s public schools has declined slightly as enrollment growth has flattened out.

Statewide, school systems report 2,170 portable classrooms, down by 87 since the 2007 inventory (see figure 12). School systems use portables to deal with unanticipated space shortages, such as those caused by natural disasters, and to provide temporary classroom space for large influxes of new students while they plan more permanent solutions. Williamson County is a good example of a system that used additional portables as a temporary solution while building new schools. They had 21 portable classrooms in 2007, 61 in 2009 pending construction of six new schools, and 22 in 2011 as those schools were completed. For this inventory, as they awaited completion of nine new schools, they increased the number of portables to 28.



As indicated in figure 12, this year’s total of 2,170 portable classrooms (3.1% of all classrooms) is just three less than the total reported last year. As illustrated in map 6, which sums system-level information on portables to the county level, most counties (70 of 95) rely on portables for 3.5% or less of their total classrooms but several use them more. Twenty-two counties rely on portables for between 3.5% and 7.5% of their classrooms and three, Cannon, Clay and Jefferson, rely on them for

Map 6. Portable Classrooms as a Percent of Total Classrooms by County July 2012 Inventory



more than 7.5%. These three counties are shaded dark blue in map 6. Cannon and Clay counties both use portables for 11% of their classrooms, and Jefferson uses portables for 8%. Cannon has reported that portables made up 11% of their classrooms each year since the 2007 inventory. Clay's use of portables peaked in 2010 at 13%, and Jefferson's use of portables peaked the same year at 12%. Information about each school system's use of portables can be found in appendix G-7.

Twenty-one school systems used more portables in 2012 than in 2007. While most school systems added only a few, five added 10 or more portables—Rhea (18), Cumberland (17), Wilson (13), Montgomery (11), and Knox (10). In the case of Rhea County, two schools added portable classrooms in 2008, which were still in use in 2012, to accommodate student population growth while a new school is being built. Cumberland County had only eight portable classrooms in 2007 but now has 25. Wilson County also increased their use of portable classrooms at three elementary schools, up 13 since 2007, because of increasing enrollment. They are 9th in enrollment growth and report the third-highest need for new space. Montgomery County has steadily increased the use of portables from 58 in 2007 to 69 in 2012. Knox County continues to use 143 portables for the fourth year in a row, at least one at 38 of their 88 schools.

Overall, 29 school systems report fewer portable classrooms in 2012 than they did in 2007. Shelby and Davidson counties, the two largest school systems, had two of the largest decreases in the number of portable classrooms. Respectively, they are using 104 and 332 portables now, which is fewer than in 2007 when they had 147 and 351. They no longer need as many portables because both systems built new schools and completed additions to existing schools. Dyer County now only uses five portable classrooms after using 25 portables since 2007 while they awaited two replacement school projects that were completed in 2012. Similarly, Hardin County decreased its number of portable classrooms to three in 2010 from 28 in 2007 by consolidating five existing schools that used portables into two schools that do not. The other 25 systems with decreases used from one to ten fewer portable classrooms, and four systems now use zero portables.

Not every system uses portables. The number of systems not using them has increased from 46 in 2007 to 48 in 2012. Four systems that had portable classrooms in 2007 no longer do—Athens, Manchester, and Hawkins and Moore counties. This could be because of slow-growing or shrinking enrollment. Athens' student enrollment decreased by 222 students and Hawkins County decreased by 317. Student enrollment in Moore County increased by only 12 students. Manchester's enrollment increased by 108 students. Since 2007, enrollment also decreased in 29 of the other 44 systems without portables. Of the 44 systems that had no portables in 2007 and still don't have any, 29 decreased in enrollment by an average of 140 students, and 14 increased by an average of 131 students.

Some school systems (42) continue to use the same number of portable classrooms as they did in 2007. The largest unchanged user of portables is Blount County, which has been using 53 portables spread out over the same ten schools in each of the past six inventories with an average age of 38 years. Portables are used mainly for two reasons—to fulfill the need for additional space caused by enrollment growth or to add temporary space needed during a period of extensive renovation. The ten schools using portables in Blount have an average of \$190 thousand in renovation and upgrade needs of which none are over \$420 thousand individually. Their enrollment numbers have increased by 338 since 2001 and quite possibly caused this need, but we anticipate this need to decrease some time in the future because after peaking in 2008, their enrollment has decreased 555 students (4.8%). The second-largest example is Jefferson County with 40 portables spread

across five schools in 2007 that are now located in three schools. Jefferson is similar to Blount in that they have had long-term enrollment growth, but have experienced decreases since 2008.

The need to improve existing school buildings continues to increase and now stands at \$2.1 billion.

The estimated cost of improving existing schools increased by almost \$54 million, from \$2 billion to \$2.1 billion (see table 17), since the last inventory and includes renovations, replacements, technology upgrades, and changes prompted by state or federal facility mandates. The increased cost for existing school infrastructure is driven mainly by the condition of the schools, and is mostly for renovations and to a lesser extent for replacements. The cost of meeting mandates has fluctuated over the years but remains a relatively small percentage of total improvement costs. Since the last inventory, these costs decreased from \$126 million to \$122 million.

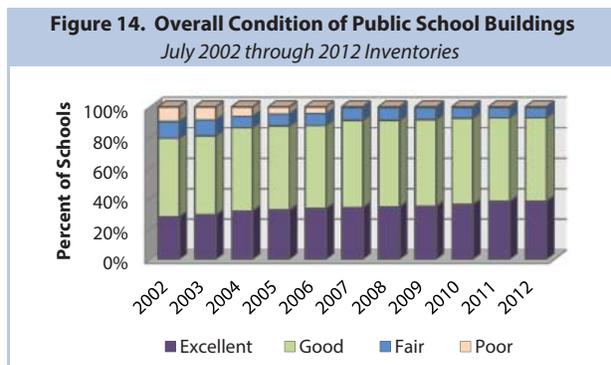
The cost to improve technology infrastructure is the one type of improvement at existing public schools that has declined since 2007.¹² These upgrade costs, such as wiring, new computer labs, and security systems, are now at their lowest level since the infrastructure inventory began and are about 17% of their \$716 million peak in 2002. They declined \$44 million (26%) since the last inventory and now stand at \$124 million. See figure 13.



Note: Technology infrastructure for new schools is included in their overall cost rather than in these figures.

The number of schools in good or excellent condition continues to increase.

For each inventory, school officials rate the overall condition of their school buildings as well as the condition of each building component based on the definitions on the next page. As figure 14 shows, the number of Tennessee's public school buildings in good or better condition has been high for several years, and a very small percentage are in fair or poor condition.¹³ The number of school buildings in excellent condition increased from 665 in the last inventory to 675, and the number rated good increased from 960 to 967. The number in fair or poor condition (127) increased by one since last year's inventory and is 7% of the total. Most of these schools have been in fair or poor condition for some time, and as indicated in map 7, they are located all across the state.



¹²All school technology infrastructure projects are included in the estimated cost of upgrading existing schools, even those projects costing less than \$50,000, in order to provide information related to the technology component of the state's education funding formula.

¹³These condition ratings are defined on page 38 and in appendix C.

School Facility Rating Scale

Excellent

Can be maintained in a “like new” condition and continually meet all building code and functional requirements with only minimal routine maintenance.

Good

Does not meet the definition of “excellent”, but the structural integrity is sound and the facility can meet building code and functional requirements with only routine or preventive maintenance or minor repairs that do not hinder its use.

Fair

Structural integrity is sound, but the maintenance or repairs required to ensure that it meets building code or functional requirements hinder—but do not disrupt—the facility's use.

Poor

Repairs required to keep the structural integrity sound or to ensure that it meets building code or functional requirements are costly and disrupt—or in the case of an individual component may prevent—the facility's use.

Ratings used in the TACIR's Public Infrastructure Needs Inventory.

Schools in fair or poor condition tend to be in more urban areas.

Although most systems (102) reported no schools in fair or poor condition, 18 reported just one, and 16 reported two or more. Nearly half of the 127 schools in fair or poor condition are in just two systems: Davidson County (34) and Knox County (28). The schools in these two systems consist mainly of older buildings; the average age is 51 years for Davidson and 71 years for Knox. Another 11 are in Hamilton County, which has the third-largest number of schools in fair or poor condition and are 61 years old on average. Another 13 systems have two to five schools rated fair or poor. The concentration of schools in fair or poor condition in urban systems is partly explained by the fact that more schools are located in these areas than in rural ones. Memphis is an anomaly because the average age of all their schools is 46 years, but they reported only four out of their 198 schools as fair and none as poor. Although more schools in fair or poor condition are in urban areas, the highest percentages are in the more rural areas of the state. See table 18.

Only three school systems reported half or more of their schools in fair or poor condition—the Coffee, Grundy, and Lake county systems. Lake County has only three schools, two of which are in less than good condition, including one that was rated good last year. All three were built before 1965. Grundy County reported half of their schools—four elementary schools built between 1927 and 1979—in fair or poor condition. Five of Coffee County's nine schools are in fair or poor condition, with an average age of 45 years. All ten schools in Manchester and Tullahoma, the other two systems in Coffee County, are in good or better condition and only two of those schools reported a need for renovations or upgrades. Coffee County is brown in map 7 because all three systems are combined.

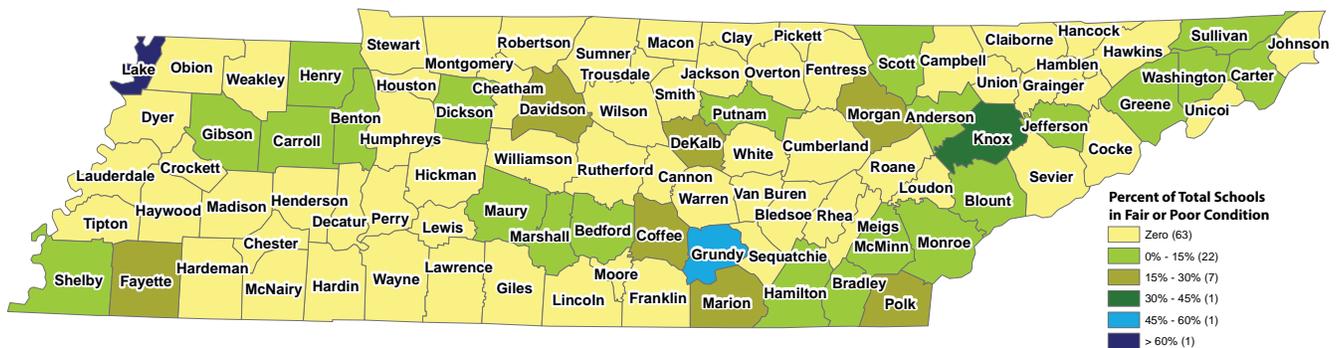
Schools in fair or poor condition tend to be older buildings.

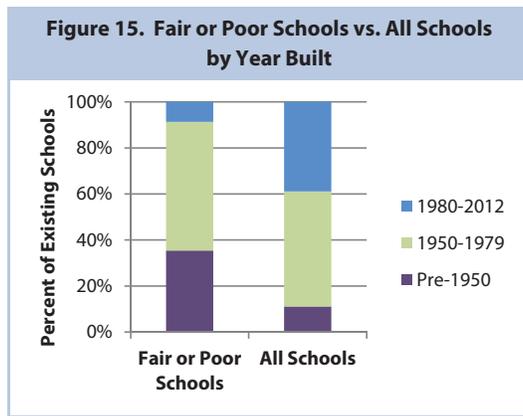
Not surprisingly, older schools are more likely to be in poorer condition. Half of the public school buildings in use today were built in the 1950s, 1960s, and 1970s when the Baby Boom generation was making its way through school. And more than half of the schools in fair or poor condition today were built during that period. Only 11% of schools in use today were built before 1950, but 35% of

Table 18. Renovation and Replacement Costs for the 16 Systems with Two or More Schools in Fair or Poor Condition
Five-year Period July 2012 through June 2017

School System	All Schools		Schools in Fair or Poor Condition			
	Number of Schools	Estimated Cost to Renovate and Replace	Number of Schools	Percent Fair/Poor	Estimated Cost to Renovate and Replace	Percent of Renovation Needs
Knox County	88	\$ 91,924,998	34	38.6%	\$ 54,774,500	59.6%
Davidson County	139	519,648,000	28	20.1%	195,155,000	37.6%
Hamilton County	76	28,075,500	11	14.5%	20,598,000	73.4%
Coffee County	9	41,755,000	5	55.6%	41,755,000	100.0%
Grundy County	8	6,765,000	4	50.0%	6,015,000	88.9%
Memphis	198	226,717,021	4	2.0%	1,464,000	0.6%
Bradley County	19	13,015,000	3	15.8%	5,260,000	40.4%
Putnam County	21	27,255,000	3	14.3%	26,505,000	97.2%
Bristol	8	39,357,000	3	37.5%	28,857,000	73.3%
Oak Ridge	8	15,073,133	2	25.0%	14,000,000	92.9%
Fayette County	11	14,160,000	2	18.2%	13,130,000	92.7%
Lake County	3	10,660,000	2	66.7%	10,660,000	100.0%
Marion County	10	8,050,000	2	20.0%	7,870,000	97.8%
Monroe County	13	33,909,630	2	15.4%	17,143,890	50.6%
Morgan County	8	5,299,000	2	25.0%	2,194,000	41.4%
Sullivan County	23	11,715,000	2	8.7%	610,000	5.2%
Subtotal	642	\$ 1,093,379,282	109	17%	\$ 445,991,390	40.8%
All Others	1,127	715,451,683	18	2%	171,331,788	23.9%
State Total	1,769	\$ 1,808,830,965	127	7%	\$ 617,323,178	34.1%

Map 7. Percent of School Buildings in Fair or Poor Condition by County As of July 1, 2012





school buildings rated fair or poor date back to that period. By contrast, 39% of all schools were built in 1980 or later, and only 9% of those are in fair or poor condition. See figure 15.

Estimated cost to improve school buildings continues to increase, mainly for renovations.

Systems seeking to improve school buildings have two choices: renovate or replace them. In some cases entire schools need to be renovated or replaced; in other cases, only parts of schools need to be upgraded. The estimated cost to renovate or replace existing schools increased by \$101 million, from \$1.7 billion to \$1.8 billion (see table 17), since the last inventory. Nearly all of

the increase (\$99 million) is for renovations, following the pattern of the last three years. The estimated cost of replacing schools has been relatively flat at about \$300 million for the last three years, down slightly from a high of \$319 million in 2009.

The average amount per school needed to renovate or replace those in fair or poor condition is almost seven times larger than the average cost to upgrade the 1,642 schools in good or excellent condition, \$4.9 million versus \$720 thousand (see table 19). Since the last inventory, costs for school renovations increased from \$1.4 billion to \$1.5 billion (7%). This is the third-consecutive year the estimated cost of renovations has increased. While school buildings in fair or poor condition cost more to fix than those in better condition, renovations at the 1,642 schools in good or excellent condition make up a larger part of the inventory—\$1 billion, an average of \$616 thousand per school. Renovations needed to bring the 127 schools in fair or poor condition to good or excellent condition will require an estimated \$487 million, an average of \$3.8 million per school.

Table 19. Renovations and School Replacement Costs by School Condition
Five-year Period July 2012 through June 2017

School Condition	Number of Schools	Estimated Cost to Renovate*	Estimated Cost to Replace	Totals	Average Cost Per School
Good or Excellent	1,642	\$ 1,011,468,387	\$ 171,359,400	\$ 1,182,827,787	\$ 720,358
Fair or Poor	127	486,602,178	130,721,000	617,323,178	4,860,812
Total	1,769	\$1,498,070,565	\$ 302,080,400	\$1,800,150,965	\$1,017,609

* Does not include facility upgrades captured in the school-system-wide category used for the total renovation cost in Table 16.

Sometimes renovating a school is not enough to meet the needs of students, and schools have to be replaced. Local officials report that they need \$302 million to replace a total of 16 schools, an increase of only 1% (\$2.6 million) from last year's report. The average cost to replace these schools is \$18.9 million. Of the 16 schools, eight are in good condition, five are in fair condition, two are in poor condition, and one is in excellent condition. All eight of the schools in good condition are at least 60 years old. School systems that cannot immediately afford to replace schools may renovate them in the meantime. Goodlettsville Middle School, built in 1936, is a great example. They need \$19 million to replace the school and \$6.8 million to upgrade the existing building in the interim.

Larger systems report greater total costs, while smaller systems often have greater costs per student.

School systems with more students have more school buildings and, therefore, greater infrastructure improvement needs than smaller systems. The ten systems with the greatest infrastructure needs account for 62% of the total cost (see table 20). Eight of them are among the ten with the most students. The other two systems are Sevier County (11th in enrollment) and Johnson City (24th in enrollment). Some systems, such as Davidson County and Memphis, report a greater need to improve existing schools while others, such as Williamson, Montgomery, Wilson, and Rutherford counties, report a greater need to build new schools.

Table 20. Ten Systems with the Highest Total Costs for Improvements
Five-year Period July 2012 through June 2017

School System	Estimated Cost				2012 Students		
	Total	Improvements to Existing Schools	New Space	System-wide	Number	Rank	Cost Per Student
Davidson County	\$ 613,189,800	\$ 524,440,800	\$ 88,749,000	\$ 0	76,130	2	\$ 8,055
Memphis	344,691,016	341,691,016	3,000,000	0	104,058	1	\$ 3,312
Williamson County	275,314,000	39,214,000	236,100,000	0	31,949	7	\$ 8,617
Montgomery County	253,276,339	60,203,000	193,073,339	0	29,728	8	\$ 8,520
Wilson County	223,017,370	77,017,370	146,000,000	0	15,637	10	\$ 14,262
Rutherford County	124,696,186	6,060,186	118,636,000	0	38,645	6	\$ 3,227
Knox County	117,125,848	95,845,848	21,280,000	0	56,298	3	\$ 2,080
Shelby County	108,379,740	46,279,740	62,100,000	0	45,563	4	\$ 2,379
Sevier County	88,206,736	12,396,736	75,810,000	0	14,216	11	\$ 6,205
Johnson City	67,957,788	51,957,788	16,000,000	0	7,425	24	\$ 9,153
Top Ten Total	\$ 2,215,854,823	\$ 1,255,106,484	\$ 960,748,339	\$ 0	419,649		\$ 5,280
All Others	1,379,519,043	800,150,450	573,577,593	5,791,000	530,896		2,598
State Total	\$ 3,595,373,866	\$ 2,055,256,934	\$ 1,534,325,932	\$ 5,791,000	950,545		\$ 3,782

Small school systems can be overlooked when considering overall costs. Compared with larger school systems, those with fewer students may report lower total infrastructure improvement costs but larger costs per student. Wilson County is the only large system that is among those with the highest total cost per student. See table 21.

The five school systems reporting the highest costs per student all need new schools. Van Buren and Pickett counties are first and second, at \$23,307 and \$21,018 per student compared with the statewide average of \$3,782. Van Buren and Pickett both need new high schools at a cost of \$15 million each. Both have been in the inventory since 2005 and remain conceptual. Alcoa needs \$30 million (\$17,385 per student) to build a new high school, DeKalb County needs a new \$42 million high school (\$15,732 per student), and Alamo needs \$8.3 million (\$14,847 per student) to enlarge Alamo Elementary. All five report needing smaller amounts to renovate space at existing schools.

Loudon County also needs a new school as well as renovations at eight of their nine existing schools; the ninth school needs to be replaced. The total cost for these improvements is more than twice the state average per student (\$9,284), which includes \$17 million for a new middle school, \$5.7 million for the renovations, and \$23 million to replace Greenback High School.

Table 21. Ten Systems with the Highest Per Student Costs for Improvements
Five-year Period July 2012 through June 2017

School System	Estimated Cost				2012 Students		
	Total	Improvements to Existing Schools	New Space	System-wide	Number	Rank	Cost Per Student
Van Buren County	\$ 17,070,000	\$ 570,000	\$ 16,500,000	\$ 0	732	125	\$ 23,307
Pickett County	15,237,500	237,500	15,000,000	0	725	126	21,018
Alcoa	30,400,000	400,000	30,000,000	0	1,749	99	17,385
DeKalb County	45,702,000	1,882,000	43,820,000	0	2,905	78	15,732
Alamo	8,790,000	540,000	8,250,000	0	592	130	14,847
Wilson County	223,017,370	77,017,370	146,000,000	0	15,637	10	14,262
Lake County	10,900,000	10,810,000	90,000	0	873	123	12,485
Bristol	42,969,500	40,969,500	2,000,000	0	3,842	59	11,183
Coffee County	42,005,000	42,005,000	0	0	4,351	51	9,655
Loudon County	45,747,000	27,939,000	17,808,000	0	4,928	43	9,284
Top Ten Total	\$ 481,838,370	\$ 202,370,370	\$ 279,468,000	\$ 0	36,334		\$ 13,262
All Others	3,113,535,496	1,852,886,564	1,254,857,932	5,791,000	914,211		3,406
State Total	\$ 3,595,373,866	\$ 2,055,256,934	\$ 1,534,325,932	\$ 5,791,000	950,545		\$ 3,782

Lake and Coffee counties and the City of Bristol report large costs per student, but mainly to upgrade rather than add space. The amount per student Lake County needs to upgrade its schools (\$12,485) is more than three times the state average and includes \$6.9 million to renovate over half of the classrooms, the cafeteria, the library, administrative offices, and the gym at Margaret Newton Elementary School and \$3.9 million to renovate Lake County High School. Lake County also needs \$90,000 for a new music classroom at Laura Kendall Elementary School.

Like Lake County, Bristol needs more than three times the state average to upgrade its schools (\$11,183), which includes \$23 million to renovate Vance Middle School and \$3.2 million to renovate 22 classrooms, the gym, the library and the cafeteria at Haynesfield Elementary. Bristol also needs \$2 million for eight new classrooms at Avoca Elementary school and \$2.8 million to renovate Tennessee High School.

Coffee County needs more than twice the average amount per student (\$9,655) and is the only system in the top ten for cost per student that is not adding space. Over half of the cost is \$24 million to replace the county middle school, which needs \$600 thousand in renovations in the meantime. Six of Coffee County's nine schools need another \$17.4 million in renovations, more than half of which (\$9 million) will be for 29 permanent classrooms and the cafeteria at North Coffee Elementary. Three portables at that school also need to be replaced.