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Drinking Water Infrastructure Needs: Background and Issues for Congress

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SUMMARY

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Drinking Water Infrastructure Needs: Background and Issues for Congress

Congress has demonstrated interest in the provision of safe drinking water and in the maintenance of existing drinking water infrastructure. Outbreaks of waterborne diseases (e.g., Legionnaires' disease) and extended boil water notices in some cities have brought attention to the current condition of the United States' drinking water infrastructure. In 2023, the U.S. Environmental Protection Agency (EPA) estimated that, over the next 20 years, the investment needed for drinking water system infrastructure would cost $648.8 billion (2022 dollars). This latest estimate is roughly $51 billion (2022 dollars), or 7.62%, more than EPA's prior estimate, published in 2018. Approximately 67% (i.e., $436.8 million) of the latest survey's estimated needs are for projects to repair or rehabilitate water systems' transmission and distribution networks. EPA's reports on drinking water infrastructure needs raise several considerations for Congress.

EPA's 2023 needs estimates follow recent increased congressional interest in drinking water infrastructure. As a reflection of this interest, Congress has increased appropriations in recent years for drinking water financial assistance programs administered by EPA. For example, the Infrastructure Investment and Jobs Act (IIJA; P.L. 117-58) provides five fiscal years of supplemental appropriations, beginning in FY2022, for the Drinking Water State Revolving Fund (DWSRF). Further, several recent acts amended the Safe Drinking Water Act (SDWA) to authorize other grant programs intended to address specific issues or assist particular communities.

Under SDWA, EPA is required to assess the "capital improvement needs of eligible public water systems" every four years. From 1996 to 2018, EPA published six reports that estimated drinking water infrastructure needs. In 2018, America's Water Infrastructure Act (AWIA; P.L. 115-270) amended SDWA to require EPA to include an assessment in the needs survey of the costs to replace all lead service lines (LSLs) in eligible public water systems. EPA published the seventh report including these LSL estimates in 2023.

Over the agency's seven reports, EPA's estimates of the costs of needed drinking water infrastructure projects have increased (after accounting for changes due to inflation). General findings from EPA's seven reports include (1) the costs of infrastructure projects for small water systems (defined as those systems serving 3,300 or fewer individuals) comprise a smaller percentage of total drinking water need, but result in higher per-household costs; and (2) the costs associated with replacement or rehabilitation of water system distribution and transmission networks represent the majority of the total estimated drinking water infrastructure need. Although not included in the seventh report, the first through sixth reports identified that the direct costs of infrastructure projects needed to comply with SDWA drinking water regulations (e.g., treatment upgrades) remain a smaller percentage of total drinking water investment need.

Congress has both explicitly and implicitly prioritized certain drinking water infrastructure needs. Statutory requirements provide examples of explicit congressional prioritization, and federal funding decisions arguably provide examples of implicit prioritization. Under the DWSRF, Congress requires that states prioritize projects that are needed to address the most serious human health risks, that are necessary to ensure SDWA compliance, and that assist systems most in need on a per-household basis according to state affordability criteria. Implicit prioritization may take the form of appropriations for specific drinking water financial assistance programs as well as dedicated funding to certain types of projects or specific projects through appropriations.

The increasing scale of drinking water infrastructure needs, including for specific categories of infrastructure needs, raises questions, including about how infrastructure needs are prioritized, how the EPA drinking water infrastructure needs survey aligns with congressional interests, and how that affects use of the survey's results. Given congressional activities to support drinking water infrastructure needs, one consideration might involve how well the needs surveys align to congressional priorities. An example of how Congress has amended SDWA to align the needs survey to its priorities is the AWIA amendments to require EPA to report on LSL replacement costs. Another consideration might involve the data collection methods used to estimate needs, and the potential tradeoffs of these methods. In addition, a consideration for Congress may involve the scale of needs estimated by the seventh survey, and the distribution of these needs among states. Given the increasing estimated needs, the needs survey and its findings are likely to continue to generate congressional attention.

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Introduction

Congress has a demonstrated interest in the provision of safe drinking water and in the maintenance of existing drinking water infrastructure. Through statute, appropriation, and report language, Congress has provided the U.S. Environmental Protection Agency (EPA) with authorities, funding, and direction to support state and local entities in meeting regulatory needs and furthering public health protection. Some key questions facing policymakers are whether available funding and efforts align with infrastructure needs and priorities and whether the present reporting mechanisms are sufficient to assess these needs.

The United States' drinking water infrastructure plays a primary role in protecting public health. Outbreaks of waterborne diseases (e.g., Legionnaires' disease) and extended boil water notices in some cities have brought attention to the current condition of the country's drinking water infrastructure. Breaks or leaks in the transmission and distribution system may result in contamination of treated water, particularly where sewer pipes are installed adjacent to drinking water mains.[1]

In 2023, EPA compiled data from states and estimated that, over the next 20 years, the investment needed for drinking water system infrastructure would cost $648.8 billion (2022 dollars).[2] This latest estimate is roughly $51 billion (2022 dollars), or 7.62%, more than EPA's prior estimate, published in 2018.[3] About 67% (i.e., $436.8 million in 2022 dollars) of the estimated needs are for projects to repair or rehabilitate water systems' transmission and distribution networks.[4] The need for routine replacement and rehabilitation projects is not novel, as a report from more than 20 years ago stated that water systems were then entering "the replacement era."[5]

Although federal spending on drinking water infrastructure represents a small portion of public spending in this sector,[6] in recent years, Congress has increased appropriations for drinking water financial assistance programs administered by EPA. For example, the Infrastructure Investment and Jobs Act (IIJA; P.L. 117-58) provides five fiscal years of supplemental appropriations, which began in FY2022, for the Drinking Water State Revolving Fund (DWSRF). Further, several recent acts amended the Safe Drinking Water Act (SDWA) to authorize other grant programs intended to address specific needs or provide support to particular communities.[7]

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[1] Contamination of drinking water from a sewer pipe depends on if that sewer pipe also had a break or leak. The U.S. Environmental Protection Agency (EPA), *Using DWSRF Funds for Transmission and Distribution Infrastructure Needs*, EPA 816-F-03-003, Washington, DC, February 2003.

[2] EPA, *Drinking Water Infrastructure Needs Survey and Assessment: Seventh Report to Congress*, September 2023, https://www.epa.gov/system/files/documents/2023-09/Seventh%20DWINSA_September2023_Final.pdf.

[3] EPA, *Drinking Water Infrastructure Needs Survey and Assessment: Sixth Report to Congress*, March 2018, https://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=P100UA7Z.txt.

[4] EPA, *Drinking Water Infrastructure Needs Survey and Assessment: Seventh Report to Congress.*

[5] American Water Works Association, *Dawn of the Replacement Era: Reinvesting in Drinking Water Infrastructure*, Denver, CO, May 2001.

[6] The Congressional Budget Office (CBO) reports that, in 2017, the federal share of total public spending on water and wastewater utilities was 4%, while state and local government expenditures accounted for 96% of all public spending on this infrastructure. CBO, *Public Spending on Transportation and Water Infrastructure, 1956 to 2017*, 2018, p. 22, https://www.cbo.gov/publication/54539.

[7] In addition to provisions added to SDWA, Congress has added a number of authorizations for the U.S. Army Corps of Engineers, within the Department of Defense, and the Bureau of Reclamation, within the Department of Interior, to address municipal water infrastructure. Further, Congress has authorized rural development programs for the U.S. Department of Agriculture's (USDA's) Rural Utilities Service. These authorities are not discussed in this report. See CRS Report R46471, *Federally Supported Projects and Programs for Wastewater, Drinking Water, and Water Supply Infrastructure*, coordinated by Jonathan L. Ramseur, for details on these and other programs.

The increasing scale of drinking water infrastructure needs, including for specific categories of infrastructure needs, raises questions, including how infrastructure needs are prioritized, how the EPA drinking water infrastructure needs survey aligns with congressional interests, and how that affects use of the survey's results.

This report begins with background on the federal role in drinking water infrastructure, as well as SDWA requirements for estimating drinking water infrastructure needs. It then analyzes how those needs have shifted over time. This report also provides information about how drinking water infrastructure projects are generally funded. The report ends with some congressional considerations, including an analysis of needs and congressional priorities, as well as context regarding the survey.

Federal Support for Drinking Water Infrastructure

Congress created the DWSRF partly to provide support to communities that were challenged to afford projects needed to comply with federal drinking water regulations, which significantly increased after the Safe Drinking Water Act Amendments of 1986 (P.L. 99-339).[8] Through the Safe Drinking Water Act Amendments of 1996 (P.L. 104-182), Congress authorized EPA to use appropriations to make grants to states.[9] States use their grant to capitalize a state revolving loan fund. Each state must match 20% of its grant and develop intended use plans (IUPs) each year indicating how the allotted funds will be used.[10] States are authorized to use their DWSRF capitalization grant to provide financial assistance (primarily subsidized loans) to eligible public water systems for the types of capital infrastructure projects that EPA has determined will facilitate SDWA compliance or significantly further the act's health protection objectives.[11] Public water systems eligible to receive DWSRF assistance are community water systems (whether publicly or privately owned) and nonprofit noncommunity water systems.[12] The federal grants and state match—combined with funds from loan repayments, leveraged bonds, and other sources—were intended to generate an ongoing (i.e., revolving) source of water infrastructure funding.

Estimating Drinking Water Infrastructure Needs

In part to understand the state of drinking water infrastructure, Congress amended SDWA in 1996 and required EPA to assess the "capital improvement needs of eligible public water systems"

[8] In 1986, responding to criticisms about EPA's regulatory pace, Congress amended the Safe Drinking Water Act (SDWA) to require EPA to establish regulations for 83 contaminants within three years, with regulations for an additional 25 contaminants every three years thereafter. After the 1986 amendments, EPA promulgated new regulations and revised existing regulations for more than 80 contaminants, attempting to keep pace with the statutory requirements. EPA, states, and water systems found this regulatory pace unworkable. CRS Report R46652, *Regulating Contaminants Under the Safe Drinking Water Act (SDWA)*, contains additional details regarding SDWA's regulatory development provisions.

[9] SDWA §1452(a); 42 U.S.C. §300j-12(a).

[10] SDWA §1452(e); 42 U.S.C. §300j-12(e); SDWA §1452(b); 42 U.S.C. §300j-12(b).

[11] SDWA §1452(a)(2)(B); 42 U.S.C. §300j-12(a)(2)(B).

[12] SDWA Section 1401 defines a *public water system* as a system that provides water through pipes or other conveyances to at least 15 service connections or that regularly serves at least 25 individuals. The act also defines *community water systems* as those that regularly serve at least 25 individuals year-round and *noncommunity water systems* as public water systems that are not community water systems.

every four years.[13] EPA undertook this assessment via a state-level needs survey. This state-by-state distribution of estimated need is a primary determinant of the state allotments of DWSRF appropriations. SDWA requires EPA to distribute the DWSRF funds among the states based on each state's proportional share of infrastructure needs as identified by the most recent needs survey, with no state receiving less than 1% of available funds.[14]

From 1996 to 2018, EPA published six reports that estimated drinking water infrastructure needs. In 2018, America's Water Infrastructure Act of 2018 (AWIA; P.L. 115-270) amended Section 1452(h) to require EPA to include an assessment of the costs to replace all lead service lines (LSLs) in eligible public water systems in the needs survey.[15] EPA published the seventh report including these LSL estimates in 2023. These reports are further detailed below.[16]

From the first to the seventh report, EPA made some revisions to the methodology used to estimate drinking water infrastructure needs, and **Table A-1** provides a summary of the differences. EPA's basic methodology relies on a survey of the largest systems' infrastructure needs,[17] and a survey of a sample of smaller systems' infrastructure needs, using those results to extrapolate or project state- and national-level estimates.[18]

Understanding the survey's methodology, how it has changed, and its potential limitations is useful for assessing the robustness of states' estimated needs. Survey changes intended to minimize the survey's burden on certain systems, states, or populations have led to the use of modeled or projected data from older surveys, as discussed below.

Some systems may lack capacity to document costs or plan for needed projects.[19] To address this, the first, second, and fourth surveys relied upon site visits to a sample of roughly 500 to 600 of the nearly 40,000 community water systems that serve 3,300 or fewer people to assess their infrastructure needs.[20] Such systems make up approximately 81% of the community water systems operating nationally. EPA used these sample data to extrapolate state- and national-level estimates of needed projects.[21] For the third survey, EPA projected these costs using data collected from the second survey. For the fifth and sixth surveys, EPA projected these costs using data

[13] SDWA §1452(h); 42 U.S.C. §300j-12(h). EPA must report each needs assessment to Congress. Concurrently, and in consultation with the Indian Health Service within the U.S. Department of Health and Human Services and Indian tribes, EPA is required to assess needs for drinking water treatment facilities that serve Indian tribes and Alaska Native villages.[13] This report does not discuss tribal and Alaskan Native drinking water infrastructure needs.

[14] SDWA §1452(a)(1)(D)(ii); 42 U.S.C. §300j-12(a)(1)(D)(ii).

[15] SDWA §1452(h)(2); 42 U.S.C. §300j-12(h)(2).

[16] EPA, *Drinking Water Infrastructure Needs Survey and Assessment: Seventh Report to Congress*.

[17] Between the third and fourth surveys, EPA changed the population threshold of what systems are considered "large" versus "medium." For the first through third surveys, large water systems served more than 50,000 people, and medium water systems served 3,301 to 50,000 people. Beginning in the fourth survey, EPA designated water systems serving more than 100,000 people as large, and those serving 3,301 to 100,000 people as medium.

[18] Initially, EPA and states, and now primarily states, review water system responses to determine that projects had acceptable documentation to estimate their costs and demonstrate their need.

[19] EPA, *Drinking Water Infrastructure Needs Survey: First Report to Congress*, EPA 812-R-97-001, Washington, DC, January 1997, https://www.epa.gov/sites/default/files/2015-07/documents/epa812r97001.pdf.

[20] EPA, *Drinking Water Infrastructure Needs Survey: First Report to Congress*; EPA, *Drinking Water Infrastructure Needs Survey: Second Report to Congress*, EPA 816-R-01-004, Washington, DC, February 2001, https://nepis.epa.gov/Exe/ZyPDF.cgi/200024WV.PDF?Dockey=200024WV.PDF; EPA, *Drinking Water Infrastructure Needs Survey and Assessment: Fourth Report to Congress*, EPA 816-R-09-001, Washington, DC, February 2009, https://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=P1004B0B.txt.

[21] EPA, *Drinking Water Infrastructure Needs Survey: First Report to Congress*; EPA, *Drinking Water Infrastructure Needs Survey: Second Report to Congress*; EPA, *Drinking Water Infrastructure Needs Survey and Assessment: Fourth Report to Congress*; EPA, *Drinking Water Infrastructure Needs Survey and Assessment: Seventh Report to Congress*.

collected from the fourth survey. In the seventh survey, EPA collected new data through a sample of roughly 600 small water systems.[22]

Similarly, EPA generated infrastructure need estimates for nonprofit noncommunity water systems by conducting site visits at 100 of the 21,400 locations for the second survey in 1999. These data informed projected costs for the third through sixth surveys. For the seventh survey, EPA did not project data from the 1999 survey for the seventh report. The agency updated its estimates through site visits to 134 of the roughly 26,000 locations.[23]

In addition to employing sampling and projections, EPA made changes to the methodology to address state concerns about the reporting burden. Beginning in 2007 with the fourth survey, EPA provided an option for certain states to have a lower level of participation.[24] States that received the minimum DWSRF allotment of 1% could choose to forgo data collection for "medium" systems that serve 3,301 to 100,000 individuals.[25] For states that chose this "partial" survey option, EPA then projected medium water system cost data to determine the national estimate of drinking water infrastructure need.[26] EPA made this option available to these "partial participation" states in the fifth, sixth, and seventh surveys.[27]

This "partial participation" approach results in some states' drinking water infrastructure needs being calculated solely based on projected data. For example, as identified in at least three of the needs surveys, some partial participation states did not have a large water system.[28] Since EPA did not perform new site visits in the fifth and sixth surveys, the need estimates for Vermont and West Virginia, two of the partial participation states, were based solely on projected data.[29] Unless EPA selected smaller water systems in these states for a site visit or to survey for the fourth and seventh surveys, the need estimates of partial participation states without a large water system would also be based only on projections.

Trends in Drinking Water Infrastructure Needs

An analysis of the seven needs survey reports highlights trends in the types of needed drinking water infrastructure projects over time. **Table 1** shows that, over the agency's seven reports, EPA's estimates of drinking water infrastructure needs have generally increased. Starting with its initial report in 1997, EPA has presented the 20-year needs estimates for projects by category: transmission and distribution, treatment, source, storage, and other.[30] EPA also includes estimates of the infrastructure needs associated with small, medium, and large community water systems. A

[22] EPA, *Drinking Water Infrastructure Needs Survey and Assessment: Seventh Report to Congress*.

[23] EPA, *Drinking Water Infrastructure Needs Survey and Assessment: Seventh Report to Congress*.

[24] EPA, *Drinking Water Infrastructure Needs Survey and Assessment: Fourth Report to Congress.*

[25] EPA, *Drinking Water Infrastructure Needs Survey and Assessment: Fourth Report to Congress*.

[26] EPA, *Drinking Water Infrastructure Needs Survey and Assessment: Fourth Report to Congress*.

[27] EPA, *Drinking Water Infrastructure Needs Survey and Assessment: Fifth Report to Congress*, EPA 816-R-13-006, Washington, DC, April 2013, https://www.epa.gov/sites/default/files/2015-07/documents/epa816r13006.pdf; EPA, *Drinking Water Infrastructure Needs Survey and Assessment: Sixth Report to Congress*; EPA, *Drinking Water Infrastructure Needs Survey and Assessment: Seventh Report to Congress.*

[28] EPA identified that, in the fourth through sixth surveys, Wyoming and Vermont chose not to survey their medium systems, and that no large water systems operate in these states. In the fourth and fifth surveys, EPA identified that North Dakota chose not to survey its medium systems and had no operating large water system.

[29] EPA, *Drinking Water Infrastructure Needs Survey and Assessment: Fifth Report to Congress*; EPA, *Drinking Water Infrastructure Needs Survey and Assessment: Sixth Report to Congress.*

[30] Examples of projects in the "other" category include laboratory equipment to test water quality, emergency power generators, and upgrades to protect infrastructure against floods and earthquakes.

comparison of the needs based on system size is challenging, because the definitions of these categories have changed over time.[31]

The agency reports on the subset of projects needed for compliance with SDWA regulations, differentiating between needs associated with microbial contaminant regulations and chemical contaminant regulations.[32] Generally, the reports have found that

- small water systems (defined as those systems serving 3,300 or fewer individuals) comprise roughly 81% of all community water systems, and their needs account for roughly 18% (on average) of the total need; in addition, their needs result in higher per-household costs, compared to households served by larger systems; and
- the costs associated with replacement or rehabilitation of water system distribution and transmission networks, which comprise the bulk of a water system's capital value, represent the majority of the total estimated drinking water infrastructure need.

Table 1. EPA's Estimates of State and Territory Drinking Water Infrastructure Need

(in billions, adjusted to 2022 dollars)

Project Category	First Survey (1995)	Second Survey (1999)	Third Survey (2003)	Fourth Survey (2007)	Fifth Survey (2011)	Sixth Survey (2015)	Seventh Survey (2021)
Transmission and Distribution	$198.32	$192.98	$382.63	$316.03	$349.24	$398.96	$436.82
Treatment	$93.08	$66.50	$89.80	$107.16	$85.99	$100.57	$110.41
Source	$28.18	$22.32	$26.58	$31.08	$25.99	$27.79	$25.86
Storage	$30.68	$42.21	$51.12	$57.53	$50.09	$60.60	$57.46
Other	$4.94	$4.35	$4.85	$3.58	$5.35	$9.57	$18.28
Total	**$355.19**	**$328.36**	**$554.96**	**$515.38**	**$516.67**	**$597.49**	**$648.83**

Source: Calculated by CRS from EPA, *Drinking Water Infrastructure Needs Survey: First Report to Congress*, 1997; EPA, *Drinking Water Infrastructure Needs Survey: Second Report to Congress*, 2001; EPA, *Drinking Water Infrastructure Needs Survey: Third Report to Congress*, 2005; EPA, *Drinking Water Infrastructure Needs Survey and Assessment: Fourth Report to Congress*, 2009; EPA, *Drinking Water Infrastructure Needs Survey and Assessment: Fifth Report to Congress*, 2013; EPA, *Drinking Water Infrastructure Needs Survey and Assessment: Sixth Report to Congress*, 2018; EPA, *Drinking Water Infrastructure Needs Survey and Assessment: Seventh Report to Congress*, 2023; and the U.S. Bureau of Economic Analysis (BEA), "Table 5.9.4. Price Indexes for Gross Government Fixed Investment by Type," accessed October 17, 2023.

Notes: Values may not total due to rounding. FY2022 dollars calculated using price index data from line 42, "water systems," of BEA Table 5.9.4. This table includes estimated needs for states and territories. The first survey included estimates for dam and raw water reservoir projects, and did not survey nonprofit noncommunity water systems. In the third survey, EPA made changes intended to encourage systems to evaluate their assets, and estimate what rehabilitation and replacement projects would be needed over the long term.

[31] For the first through third surveys, "large" water systems were those systems serving more than 50,000 people, "medium" systems were those serving 3,301 to 50,000 people, and "small" systems were those serving 3,300 or fewer individuals. Between the third and fourth reports, EPA adjusted the size cutoffs for large and medium systems. Beginning in the fourth survey, large water systems serve more than 100,000 individuals, and medium systems serve 3,301 to 100,000 individuals.

[32] See **Appendix B** for more detail.

The first through sixth reports indicate that the direct costs of infrastructure projects needed to comply with SDWA drinking water regulations (e.g., treatment upgrades) remain a comparatively smaller percentage (e.g., 9% to 21%) of total drinking water need. Such projects are a subset of the projects that make up the treatment category. These SDWA regulatory costs comprised the highest proportion (i.e., 21%) of total need in the second survey; since then, they have comprised a smaller portion of overall need, making up roughly 12% in the sixth survey. Of this "regulatory need," the costs of projects needed to comply with microbial contaminant regulations generally outpaced those associated with chemical contaminants.[33] The seventh report did not provide analogous details on estimated need for SDWA compliance.[34]

While overall infrastructure needs have increased, transmission and distribution, storage, and "other" categories of need have grown most from the first to the seventh surveys. In general, EPA attributes the increase in reported needs in these categories as resulting from water systems' improved efforts to inventory their needed projects. For example, the increase in transmission and distribution needs between the second and third surveys overlapped with the revised asset management approach that the third survey's questionnaire employed, which led water systems to "consider and report a larger number of rehabilitation and replacement projects."[35] This may explain the increase between the second and third surveys, though it does not fully address why this category of need has increased from the fourth to seventh surveys. While some categories have increased more than others, the relative proportion of each category of need has remained similar over time. **Figure 1** shows each category's proportion of overall need for each survey.

The percentage of need associated with "source" and "treatment" project categories has generally decreased. For example, treatment needs comprised roughly 26% of the first report's overall estimated need.[36] Beginning with the fifth report, treatment needs have remained at about 17% of the total overall need.[37] Similarly, the "source" project category has reduced from almost 8% of overall need, as estimated by the first report, to 4% of the estimated need in the seventh report.[38] While these categories' percentages of total need have decreased, the numeric values of some of these categories have increased.

[33] For the first and sixth reports, EPA did not include the compliance-related costs for proposed or recently promulgated regulations. For the seventh report, EPA did not specify costs for existing or proposed regulations.

[34] EPA, *Drinking Water Infrastructure Needs Survey: Seventh Report to Congress*.

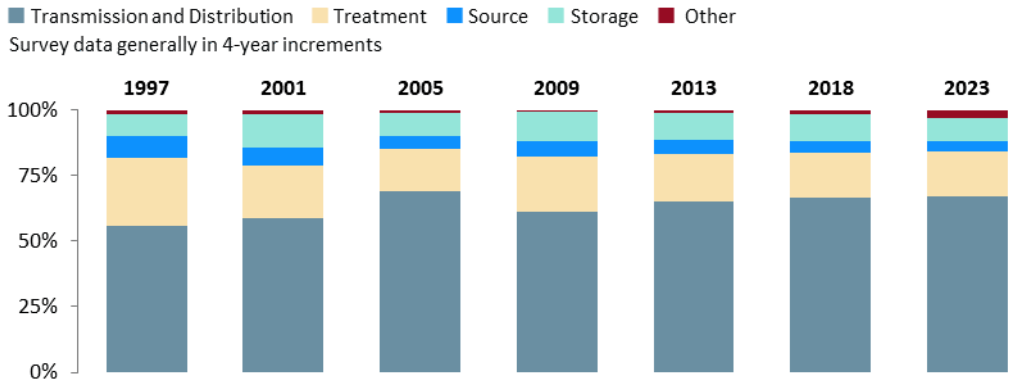
[35] EPA, *Drinking Water Infrastructure Needs Survey: Third Report to Congress*, Washington, DC, June 2005, https://nepis.epa.gov/Exe/ZyPDF.cgi/91019EXM.PDF?Dockey=91019EXM.PDF.

[36] EPA, *Drinking Water Infrastructure Needs Survey: First Report to Congress*.

[37] EPA, *Drinking Water Infrastructure Needs Survey and Assessment: Fifth Report to Congress*; EPA, *Drinking Water Infrastructure Needs Survey and Assessment: Sixth Report to Congress*; EPA, *Drinking Water Infrastructure Needs Survey and Assessment: Seventh Report to Congress*.

[38] EPA, *Drinking Water Infrastructure Needs Survey: First Report to Congress*; EPA, *Drinking Water Infrastructure Needs Survey and Assessment: Seventh Report to Congress*.

Figure 1. State and Territory Drinking Water Infrastructure Need, by Project Category



Source: EPA, *Drinking Water Infrastructure Needs Survey: First Report to Congress*, 1997; EPA, *Drinking Water Infrastructure Needs Survey: Second Report to Congress*, 2001; EPA, *Drinking Water Infrastructure Needs Survey: Third Report to Congress*, 2005; EPA, *Drinking Water Infrastructure Needs Survey and Assessment: Fourth Report to Congress,* 2009; EPA, *Drinking Water Infrastructure Needs Survey and Assessment: Fifth Report to Congress*, 2013; EPA, *Drinking Water Infrastructure Needs Survey and Assessment: Sixth Report to Congress*, 2018; and EPA, *Drinking Water Infrastructure Needs Survey and Assessment: Seventh Report to Congress*, 2023.

Note: The first through sixth needs surveys were completed in 4-year increments, beginning in 1995. The sixth needs survey was conducted in 2015, and the seventh was conducted in 2021.

Paying for Drinking Water Infrastructure

A fundamental question related to the drinking water infrastructure investment need is who pays for these projects. The Congressional Budget Office (CBO) found that (between 1956 and 2017) federal sources made up a small portion (4%) of public funding for both drinking water and wastewater infrastructure projects.[39]

The two primary categories of water system spending are operations and maintenance (O&M) and capital investments. EPA's drinking water needs surveys include only the costs of needed capital investments. Generally, O&M spending covers the activities needed to (1) ensure the system produces and distributes treated water, and (2) ensure that the treatment plant and other equipment is working. Typically, customers' water bills support O&M and sometimes long-term capital investments.[40]

Nearly 50,000 community water systems operate nationally, and water pricing structures vary (e.g., tiered rates to encourage conservation or flat rates for all users). Although systems generally have flexibility in determining a pricing structure, certain privately owned systems in most states (and, in some states, publicly owned systems) are subject to local and state requirements, including from state public utility commissions, that may involve establishing rates at a level that fully covers the costs of providing the service as well as long-term capital plans.[41] Smaller

[39] CBO, *Public Spending on Transportation and Water Infrastructure, 1956 to 2017*, 2018, https://www.cbo.gov/publication/54539.

[40] EPA, *The Clean Water and Drinking Water Infrastructure Gap Analysis*, EPA-816-R-02-020, Washington, DC, September 2002, p. 17.

[41] EPA, *An Overview of PUC s for State Environment and Energy Officials*, May 10, 2010, https://www.epa.gov/sites/default/files/2016-03/documents/background_paper.pdf.

privately owned systems and most publicly owned systems may not be subject to full-cost-recovery rate-setting requirements.[42]

What customers pay for water service depends on several factors, including investments needed to repair aging infrastructure or to comply with regulatory requirements, and system characteristics like size and source water quality. For example, larger urban water systems serve more customers in a concentrated area, meaning that these systems have a larger rate base from which to support costs. Smaller rural systems may have customers who are spread out, requiring an extensive piped distribution system. Accordingly, distribution or transmission projects in rural areas may result in a higher per-household cost, as compared to those that take place in larger urban cities with higher-density development. For example, the American Water Works Association estimated in 2001 that household cost impacts of drinking water infrastructure projects would be two to three times higher in smaller systems due to their smaller rate base as well as their "tendency for replacement needs to be less spread out over time."[43]

In addition to the question of payment is whether the existing level of water system spending (i.e., supported by revenues from customers' water bills and/or financing) is sufficient to cover the need. Assessing whether projected water service payments or financing would cover the estimated need would require detailed national-level estimates of water spending. Some water rate information exists publicly. Specifically, the Environmental Finance Center at the University of North Carolina, Chapel Hill, provides water rate information for utilities that voluntarily submitted such data from a subset of states.[44] Other states collect rate information for all or a subset of drinking water systems.[45] Regarding national-level data, EPA published a report in 2002 finding that a "significant" funding gap may develop between estimated needs and spending over 20 years if the systems' levels of spending and operational practices continued, though the report also stated that an increase of 3% in water revenues would make the gap "largely disappear."[46]

Needs Survey Observations

The seventh report identified the largest estimated need for drinking water capital infrastructure projects out of the surveys completed so far. Generally, stakeholders have attributed the increases in drinking water infrastructure needs to the age of drinking water infrastructure,[47] though the increase in estimated need likely arises from several factors, discussed below.

One factor that likely drives states' estimated needs is the number of people who live in that state. Among the surveys, either 8, 9, or all of the 10 states with the highest estimated needs were the states with the largest populations.[48] Further, the characteristics of the water systems within a

[42] EPA, *An Overview of PUC s for State Environment and Energy Officials*.

[43] American Water Works Association, *Dawn of the Replacement Era: Reinvesting in Drinking Water Infrastructure*, Denver, CO, May 2001.

[44] SDWA Section 1420(g) requires EPA to provide initial funding for one or more university-based "environmental finance centers" to provide technical assistance to state and local officials to develop water system capacity.

[45] See, for example, Ohio Environmental Protection Agency, "Sewer and Water Rate Survey, 2022," https://epa.ohio.gov/divisions-and-offices/environmental-financial-assistance/reports-and-data/sewer-and-water-rate-survey.

[46] EPA, *The Clean Water and Drinking Water Infrastructure Gap Analysis*.

[47] See, for example, American Society of Civil Engineers, "2021 Report Card for America's Infrastructure: Drinking Water," https://infrastructurereportcard.org/cat-item/drinking-water-infrastructure/.

[48] CRS analysis of state-by-state needs estimates from EPA's needs surveys, and data on state populations identified in the U.S. Census Bureau's *2000-2010 Intercensal Estimates*; *State Population Totals: 2010-2019*; and *State Population*
(continued...)

state may also affect infrastructure estimates. For example, 8 of the 10 states with the greatest number of "large" community water systems, serving more than 100,000 people, also had the highest estimated needs.[49] Of the 461 large community water systems, 284 are located in these 8 states.[50]

Another factor leading to increased needs could be improved capacity by states and water systems to estimate needed projects. Between the publication of the two most recent surveys (i.e., the sixth and seventh), Congress enacted SDWA capacity development revisions, which encourage asset management. The increase in total drinking water infrastructure needs between the two latest surveys could be partially attributed to better project identification due to water systems' asset management activities. The scale of the effect of these more recent statutory changes is challenging to assess, however, as EPA's questionnaire relied upon an asset management approach that was in place since the third survey in 2003.

Deferred maintenance of existing infrastructure may be another factor contributing to the increase in drinking water infrastructure needs. Federal support through the DWSRF is available for capital infrastructure improvements, not for O&M costs.[51] In 2000, EPA calculated that O&M spending comprised 70% of total drinking water infrastructure spending, and anticipated that O&M costs would increase as infrastructure ages.[52] Increasing O&M costs may challenge water systems' finances, particularly if such systems keep customer rates constant.[53] One potential way that water systems may manage increasing O&M costs is to postpone (i.e., defer) capital infrastructure projects, using funds set aside for those purposes to pay for O&M. Accordingly, increasing O&M costs may result in increased need for capital infrastructure projects. EPA argued that deferring capital projects may further drive costs upward, as deteriorating infrastructure likely requires more spending (than making repairs before deterioration) to maintain levels of service.[54]

Treatment Need

Generally, identifying factors that affect specific categories of need is not straightforward. In EPA's needs survey, the "treatment" category demonstrates the range of factors that may influence a project category. Since the 1996 SDWA amendments, EPA has not finalized any drinking water regulations for new contaminants, but has proposed regulations covering several new contaminants.[55] The agency has also revised or announced that it intends to revise

Totals and Components of Change: 2020-2022. Data from the first and second surveys not included in the average calculations. **Appendix C** contains state-by-state details.

[49] CRS analysis of EPA's seven drinking water infrastructure needs surveys and EPA's Safe Drinking Water Information Systems, Water System Summary report, generated November 9, 2023. The search parameters were "community water systems" not including those owned by the federal government. Data on state populations identified in the U.S. Census Bureau's *2000-2010 Intercensal Estimates*; *State Population Totals: 2010-2019*; and *State Population Totals and Components of Change: 2020-2022*. Data from the first survey are not included in these calculations, as U.S. Census Bureau population estimates for 1997 were not readily available.

[50] EPA, Safe Drinking Water Information Systems (SDWIS), Water System Summary report, generated November 9, 2023. The search parameters were "community water systems" not including those owned by the federal government.

[51] SDWA §1452(a)(2)(B); 42 U.S.C. §300j-12(a)(2)(B).

[52] EPA, *The Clean Water and Drinking Water Infrastructure Gap Analysis*.

[53] EPA, *The Clean Water and Drinking Water Infrastructure Gap Analysis*.

[54] EPA, *The Clean Water and Drinking Water Infrastructure Gap Analysis*.

[55] For example, EPA proposed a drinking water regulation to cover six per- and polyfluoroalkyl substances (PFAS). CRS In Focus IF12367, *Safe Drinking Water Act: Proposed National Primary Drinking Water Regulation for Specified PFAS* contains more information on this proposal.

regulations for existing contaminants. As such, factors other than new federal regulations may influence the increases in this category of need. These factors could include anticipation of a proposed drinking water regulation, treatment projects to address deteriorating source waters, or projects to address state-promulgated drinking water regulations.

The first through sixth reports specifically identified the cost of projects needed for compliance with existing or proposed SDWA regulations. In addition to costs associated with existing SDWA regulations, the second through fifth reports identified treatment costs associated with proposed or recently promulgated regulations based on such regulations' economic analyses.[56] EPA's seventh report did not identify the cost of projects needed for compliance with existing or proposed SDWA regulations.[57] Given the seventh report's September 2023 publication date, it is uncertain if that report includes costs to comply with EPA's March 2023 proposed drinking water regulation for per- and polyfluoroalkyl substances (PFAS).[58] EPA's economic analysis for the proposed PFAS regulation estimates that annual water system treatment costs, including O&M, could range from $640.9 million to $791.6 million in 2022 dollars.[59] It is not clear what portion of these annual treatment cost estimates would be for installing treatment technology rather than O&M.

Transmission and Distribution Need

An estimated 2.2 million miles of pipe comprise the transmission lines and distribution mains that provide treated water to those served by the nation's approximately 50,000 community water systems.[60] EPA states that the distribution and transmission network comprises the majority of a water system's capital value.[61] This network being the largest asset of a water system could explain why this project category's needs represent the majority of overall drinking water infrastructure need.

Infrastructure age and soil characteristics affect the need for transmission and distribution projects. In 2022, EPA estimated that the useful life of transmission lines and distribution mains ranges from 35 to 40 years.[62] Previously, EPA reported that the majority of the nation's transmission and distribution systems were constructed after the 1960s,[63] meaning that much of the nation's transmission and distribution network is at the end of its useful life. Yet, the deterioration rate of these piped networks varies depending on water system age, climatic conditions, pipe material, water characteristics, and soil properties. EPA notes that pipes of the same material can last anywhere from 15 years to more than 200 years based on the characteristics of the soil.[64] Further, the rate that pipes deteriorate is affected by the relative age of

[56] See **Table B-1** for details on needs associated with existing or proposed SDWA regulations.

[57] EPA, *Drinking Water Infrastructure Needs Survey and Assessment: Seventh Report to Congress*.

[58] For more information about this proposed regulation, see CRS In Focus IF12367, *Safe Drinking Water Act: Proposed National Primary Drinking Water Regulation for Specified PFAS*, by Elena H. Humphreys.

[59] EPA, "PFAS National Primary Drinking Water Regulation Rulemaking," 88 *Federal Register* 18638-18754, March 29, 2023. "Table 37—National Annualized Costs, Proposed Option" presents the treatment costs in 2021 dollars as $617.1 million to $762.5 million. CRS calculated FY2022 dollars using price index data from line 42, "water systems," of U.S. Bureau of Economic Analysis (BEA), "Table 5.9.4. Price Indexes for Gross Government Fixed Investment by Type," accessed October 17, 2023.

[60] EPA, *Drinking Water Infrastructure Needs Survey and Assessment: Sixth Report to Congress*.

[61] EPA, *The Clean Water and Drinking Water Infrastructure Gap Analysis*.

[62] EPA, *Asset Management: A Handbook for Small Water Systems*, EPA 816-R-21-006, Washington, DC, April 2022.

[63] EPA, *Using DWSRF Funds for Transmission and Distribution Infrastructure Needs*, EPA 816-F-03-003, Washington, DC, February 2003.

[64] EPA, *The Clean Water and Drinking Water Infrastructure Gap Analysis*.

the transmission and distribution system, with older pipes deteriorating at a faster rate than newer pipes.[65]

Congressional Prioritization of Needs

Congress has both explicitly and implicitly prioritized certain types of drinking water infrastructure needs. Statutory requirements provide examples of explicit congressional prioritization, and federal funding decisions arguably provide examples of implicit prioritization. While federal spending remains a small percentage of overall public spending in this sector, an evaluation of federal funding levels and allocation (i.e., which types of projects receive support) provides an indication of congressional prioritization of needs. The primary federal drinking water infrastructure assistance program is the DWSRF, though other programs exist that may support such projects.[66]

From the time of the program's establishment, Congress has explicitly prioritized certain types of needs within the DWSRF. Congress established the DWSRF, in part, to support communities' compliance with newly adopted federal drinking water regulations, some of which required infrastructure improvements for certain systems. Under the DWSRF, Congress requires that states prioritize projects that are needed to address the most serious human health risks, that are necessary to ensure SDWA compliance, and that assist systems most in need on a per-household basis according to state affordability criteria.

Over time, Congress has clarified the eligibility provisions for the DWSRF program. Before 2018, the act did not identify specific project types eligible for the DWSRF, providing instead that they be focused on SDWA compliance or needed to further the act's public health protection goals. Yet, SDWA does explicitly exclude projects needed to support population-related growth from being eligible for DWSRF assistance, as well as O&M expenditures.[67] Aside from these limitations, SDWA delegated to EPA to clarify which project types would meet statutory objectives. In more recent amendments to the DWSRF, Congress explicitly added that among the types of projects eligible are rehabilitation and replacement projects.[68] These changes indicate congressional support for more routine needed projects. This clarification may be related to findings from the needs survey that the proportion of SDWA regulatory need has decreased as a proportion of the total need.

Other legislative activities provide further indication of congressional support for specific types of needs. For example, Congress has provided additional support to address the needs of communities that may be challenged to afford drinking water infrastructure projects. Recent DWSRF amendments authorize states to provide more "additional subsidization" (e.g., principal forgiveness) rather than a subsidized loan for communities that meet state affordability criteria. Further, in the American Recovery and Reinvestment Act of 2009 (ARRA; P.L. 111-5), Congress began explicitly directing states through appropriations to use a percentage of their DWSRF capitalization grant for additional subsidization. More recently, in the Infrastructure Investment and Jobs Act (IIJA; P.L. 117-58), Congress increased the percentage dedicated to additional

[65] EPA, *Using DWSRF Funds for Transmission and Distribution Infrastructure Needs*.

[66] See CRS Report R46471, *Federally Supported Projects and Programs for Wastewater, Drinking Water, and Water Supply Infrastructure*, coordinated by Jonathan L. Ramseur, for more details on these programs.

[67] 42 U.S.C. §300j-12(g)(3).

[68] America's Water Infrastructure Act of 2018 (AWIA; P.L. 115-270) revised the DWSRF provisions to expressly state that DWSRF funds can be used for projects to replace or rehabilitate aging treatment, storage, or distribution systems.

subsidies in the DWSRF supplemental appropriations, and amended SDWA to increase the amount of additional subsidization that states were required to provide.[69]

Congressional funding decisions also indicate prioritization of specific needs. This prioritization may include increased appropriations for specific drinking water financial assistance programs as well as dedicated funding to certain types of projects through appropriations. For example, through IIJA, Congress provided additional funding for projects needed to address sources of contamination that may be the result of prior practices or legacy industrial activity. IIJA provides $3.0 billion to the DWSRF, beginning in FY2022, to support LSL replacement projects. Given that the use of LSLs was popular during a particular time period, these appropriations may be intended to assist communities that have a need due to the time of their development. Further, in the National Defense Authorization Act for Fiscal Year 2020 (P.L. 116-92), Congress authorized a grant program within the DWSRF for projects to address emerging contaminants, specifically focused on PFAS.[70] IIJA provided $4.0 billion over five fiscal years, beginning in FY2022, for this grant program. The federal funding Congress provided for these specific types of projects—to address sources of the contamination from plumbing practices from years ago,[71] or from prior industrial activity[72]—is another example of how Congress has provided support for specific needs.

Outside of the DWSRF, Congress has prioritized certain projects and communities' needs through funding decisions in other statutes and programs. For example, the Water Infrastructure Improvements for the Nation Act (WIIN Act; P.L. 113-422), America's Water Infrastructure Act of 2018 (AWIA; P.L. 115-270), and IIJA added a number of grant programs to SDWA. Some of these programs were created to address lead in drinking water through "lead remediation activities" and/or testing for lead in school and childcare program drinking water, or assisting disadvantaged or "underserved" communities with projects needed for SDWA compliance. Annual appropriations acts have provided appropriations for some, but not all, of these authorized grant programs.[73]

Prioritization Mechanisms

Under some federal financial assistance programs, Congress has established different mechanisms to determine which needs to support. For example, under the Water Infrastructure Finance and Innovation Act (WIFIA) program,[74] Congress directs EPA to prioritize credit

[69] For more information, see CRS Report R46892, *Infrastructure Investment and Jobs Act (IIJA): Drinking Water and Wastewater Infrastructure*, by Elena H. Humphreys and Jonathan L. Ramseur.

[70] Congress authorized appropriations of $100 million annually from FY2020 through FY2024 for this grant program. As discussed in "Treatment Need," the extent to which the treatment needs for PFAS were included in the seventh survey is unclear.

[71] For more information, see CRS Report R46794, *Addressing Lead in Drinking Water: The Lead and Copper Rule Revisions (LCRR)*, by Elena H. Humphreys.

[72] For more information, see CRS Report R45986, *Federal Role in Responding to Potential Risks of Per- and Polyfluoroalkyl Substances (PFAS)*, coordinated by Elena H. Humphreys.

[73] See the following CRS In Focus reports for details. CRS In Focus IF10883, *Overview of U.S. Environmental Protection Agency (EPA) Water Infrastructure Programs and FY2018 Appropriations*; CRS In Focus IF11485, *U.S. Environmental Protection Agency (EPA) Water Infrastructure Programs and FY2020 Appropriations*; CRS In Focus IF11724, *U.S. Environmental Protection Agency (EPA) Water Infrastructure Programs and FY2021 Appropriations*; CRS In Focus IF12103, *U.S. Environmental Protection Agency (EPA) Water Infrastructure Programs and FY2022 Appropriations*; CRS In Focus IF12309, *U.S. Environmental Protection Agency (EPA) Water Infrastructure Programs and FY2023 Appropriations*.

[74] The Water Resources Reform and Development Act of 2014 authorized the Water Infrastructure Finance and (continued...)

assistance and/or direct loans using broad selection criteria such as the water infrastructure project's national or regional significance with respect to economic and public benefits, creditworthiness, and readiness.[75] Further, WIFIA establishes a minimum project cost of $20.0 million or of $5.0 million for communities of 25,000 or fewer individuals, indicating a prioritization of larger-scale projects. This program may be seen to complement the DWSRF program, which is generally used for smaller-scale projects.[76]

Congressional mechanisms to address drinking water infrastructure needs go beyond structuring assistance. For example, as previously noted, Congress amended SDWA in 2018 to encourage water systems to adopt asset management plans.[77] Other enacted SDWA amendments have involved developing water system financial capacity, as well as technical and managerial capacities, to comply with SDWA, including limiting assistance for systems that lack such capacity. The existing SDWA capacity development provisions are consistent with EPA's, states', and communities' increased focus on alternative management and financing strategies to address costs and promote greater financial self-reliance among water systems.

Role of "Earmarks"

Another mechanism indicating the prioritization of certain communities' needs is the process of earmarking funds for such communities' projects. The 117th Congress reestablished the practice of funding water infrastructure projects directly through community project funding/congressionally directed spending (CPF/CDS) items, which are commonly referred to as *earmarks*.[78] Congress determines directly through the annual appropriations process the community projects that receive an earmark. In contrast, under the DWSRF, states identify projects to be funded on the IUP.

Congress may decide to use this mechanism of prioritization for a number of reasons. In some cases, a community may have been unsuccessful in seeking state approval to fund a project under the DWSRF or been unsuccessful under another program. Further, Congress may consider a more direct role given the timing of specific water infrastructure projects. For some communities, the cost of a project financed through a subsidized loan could be deemed unacceptably high, because repaying the loan would result in increased user fees that may be challenging for customers. In addition, Congress may directly assist communities that may be challenged in applying for DWSRF assistance or may lack the capacity to do so. Accordingly, earmarks are another mechanism by which certain communities' needs are prioritized.

Considerations for Congress

EPA's reports on drinking water infrastructure needs raise several considerations for Congress. Given congressional activities to support drinking water infrastructure needs, one consideration

Innovation Act (WIFIA) program to promote development of and private investment in water infrastructure projects (33 U.S.C. §§3901-3914).

[75] 33 U.S.C. §3907(b).

[76] According to EPA's 2022 National Information Management System report, the average assistance agreement amount in FY2022 was $3.0 million for the DWSRF. See EPA, "Drinking Water State Revolving Fund National Information Management System Reports," https://www.epa.gov/dwsrf/drinking-water-state-revolving-fund-national-information-management-system-reports.

[77] SDWA §1420; 42 U.S.C. §300g-9.

[78] CRS Report R47633, *The Role of Earmarks in CWSRF and DWSRF Appropriations in the 117th Congress*, by Elena H. Humphreys, contains more details on this practice.

might involve how well the needs estimates align to these priorities. Another consideration might involve the data collection methods used to estimate needs, and the potential tradeoffs of EPA's estimation method. In addition, a consideration for Congress may involve the scale of needs estimated by the seventh survey, and how the funding aligns to the state distribution of needs.

Needs Estimates and Congressional Priorities

Given EPA's publication of the seventh report, one consideration for policymakers might be how well the needs surveys align with congressional priorities, particularly given the role of the survey in determining state DWSRF allotments. As discussed above, Congress has determined that different needs warrant different levels and different types of support. For example, SDWA requires states to prioritize projects needed for regulatory compliance when providing financial support through the DWSRF. In its seventh survey report, EPA did not explicitly identify needs for SDWA compliance. Estimates of these needs may be relevant given EPA's March 2023 proposed PFAS regulation.[79] EPA's proposed regulation estimated that water bills for households served by systems that have to install treatment to address PFAS or change a water source may increase annually by $12.48 to $1,174 (in 2022 dollars).[80] It is unclear whether needed treatment projects to address PFAS are included in the seventh survey.

In addition, recent amendments to SDWA indicate support for assisting disadvantaged communities with needed projects. So far, the needs surveys have not specifically reported on the estimated needs of disadvantaged communities. An example of how Congress has amended SDWA to align the needs survey to congressional priorities is the AWIA amendments, which require EPA to report on LSL replacement costs. Other amendments to align the survey with specific categories of needs (e.g., regulatory) or to certain communities (e.g., disadvantaged communities) could be an option for Congress as it considers the latest needs survey results in the context of recent congressional priorities. Deliberations may include whether the needs survey could better capture explicit or implicit congressional priorities.

Survey Data Collection

Another consideration for policymakers regards the needs surveys' data collection methods. The data collection methods used to estimate needs vary depending on the size of water systems. For each report, EPA sends questionnaires to all larger water systems in each state. Therefore, the larger systems' needs are based on actual responses from such systems. Smaller systems' needs are either extrapolated using a sample from existing systems or projected based on prior sampling efforts.

This approach accounts for the different capacities of systems and reduces administrative burdens for EPA. Yet, this practice may raise questions about the survey results' utility in determining allotments of DWSRF capitalization grants. The methods employed to calculate smaller systems'

[79] See CRS In Focus IF12367, *Safe Drinking Water Act: Proposed National Primary Drinking Water Regulation for Specified PFAS*, by Elena H. Humphreys, for more details.

[80] EPA, *Proposed PFAS Rule Economic Analysis: Table C-37, Mean Annualized Cost per Household in CWSs that Treat or Change Water Source, Proposed Option (PFOA and PFOS MCLs of 4.0 ppt and HI of 1.0) (Commercial Cost of Capital, $2021)*, Washington, DC, March 2023. CRS calculated FY2022 dollars using price index data from line 42, "water systems," of U.S. Bureau of Economic Analysis (BEA), "Table 5.9.4. Price Indexes for Gross Government Fixed Investment by Type," accessed October 17, 2023. Household-level costs vary widely depending on factors such as water source quality and needed treatment, as well as the customer base of the water system. For example, these costs may be higher for smaller systems that require advanced treatment to comply with the PFAS regulation, and lower for larger systems that switch or blend water sources to comply with the regulation.

needs involve a higher degree of uncertainty than for larger systems. As such, this could result in an overestimation or underestimation of need for these systems.

In particular, the survey's approach raises questions over the reliability of the data used to estimate the bulk of the needs. From the first to the seventh survey, a majority of the total estimated need has been calculated based on projected data or a sample of systems. In the latest survey, roughly 62% of the total estimated need is based on projections from a sample or projected data. As discussed in the "Estimating Drinking Water Infrastructure Need" section, some partial participation states may have estimated needs based solely on projected data or a sample for some surveys. Over the seven surveys, EPA has employed approaches intended to ensure that sampling methodology is statistically sound, yet it is noteworthy that the majority of the estimated needs are calculated based on either a sample approach or projections.

In addition, some may question whether the estimates appropriately account for geographical factors and differences, particularly for medium systems. For example, for partial participation states, medium systems' needs are projected based on estimated data from other states' medium systems. The costs to complete projects may vary significantly depending on where the project is located (e.g., in California versus in Alaska).

While the needs survey reports involve projections, tradeoffs exist to using more expansive approaches to estimate water system needs. For example, requiring EPA to survey all or most systems for each report would likely increase significantly the time and resources required to complete the survey. Further, given the scale of needs for these smaller community water systems, it is uncertain whether the accuracy gained by more robust surveying would result in significant increases in the total need, though such an expanded approach may change the distribution of some states' estimated need. One question may be whether the accuracy gained would warrant the increased resources required. Estimating the infrastructure needs of systems and states requires EPA to develop an approach that balances the agency's resources with the objective of accuracy.

Regarding accuracy, other questions may include whether EPA has assessed the precision of prior samples' estimates or projections. Based on information provided in the seven reports, it is uncertain if the agency has made such assessments. Making such assessments would likely require additional resources to determine whether such needed projects materialized as the survey estimated.

Understanding the scale of uncertainty may provide information to policymakers. In 2002, the U.S. Government Accountability Office (GAO) recommended that EPA report the needs estimates' level of precision to account for uncertainty.[81] Generally, EPA reports that the agency's objective is to be 95% confident that the needs of medium and large systems (serving 3,300 or more individuals) is within 10% of the estimates for states that fully participate in the survey. Given this level of uncertainty, one consideration may involve whether a higher degree of precision is needed, particularly given the use of the results of the survey to allot DWSRF funds among the states. Yet, as discussed, achieving a greater degree of precision may involve additional resources and time for EPA, states, and water systems. Given these tradeoffs, the use of the needs survey to identify the 20-year infrastructure need, and further calculate DWSRF capitalization grants, may warrant attention, particularly given questions over the representativeness of the majority of the estimated needs. At the same time, other federal assistance programs for infrastructure projects are not structured to distribute assistance based on

[81] U.S. Government Accountability Office, *Drinking Water: Key Aspects of EPA's Revolving Fund Program Need to Be Strengthened*, 02-135, January 2002, https://www.gao.gov/assets/a233252.html.

needs estimated by a survey. As such, the needs survey and its role for determining state DWSRF allotments is novel compared to other programs, such as the Clean Water State Revolving Fund.[82]

Scale of Needs and Investments

Other considerations for Congress involve the scale of estimated needs for states, and how the funding provided aligns to the state distribution of overall need. The seventh report finds that states vary significantly in their estimated needs. The two states with the highest and lowest estimated needs provide an illustrative example. Over the next 20 years, the seventh report estimates that Alaska's annual need would be roughly $70.7 million (in 2022 dollars), while California's annual need would be $4.3 billion dollars (in 2022 dollars).[83] For FY2023, Congress provided $34.2 million for drinking water infrastructure projects to Alaska, roughly 48.3% of Alaska's estimated annual need; and $354.9 million to California, roughly 8.2% of California's estimated annual need.[84] These values include funds provided as CPF/CDS items, or earmarks.

Since the establishment of the DWSRF, Alaska has received the minimum allotment percentage of 1%, while California has generally received the highest percentage, receiving between 8% and 10% of the DWSRF appropriation available for state grants.[85] At the same time, the past six surveys indicate that Alaska's annual need in constant dollars has not reduced over time, and California's need has more than doubled. This may cause some stakeholders to raise questions over differences between the needs and the allotments. While federal spending makes up a smaller percentage of public spending for these projects, policymakers considering this example may explore questions over the capacity of states with larger systems and populations to pay for needed projects, despite having larger rate bases. At the same time, an incentive exists for states to report higher needs given the role of needs estimates in determining DWSRF allotments.

More generally, the increasing needs nationwide indicate that water system investment is not keeping pace with the needs. On the role of water rates, the current state of water system rate-setting practices—specifically, whether rates are set at levels that cover the full cost of providing service, including identified future infrastructure needs—remains largely unknown at the national level. In 2002, EPA identified that an increase in water system spending at the local level of roughly 3% would largely close the funding gap between drinking water needs and the level of spending.[86] The results of the seventh survey indicate that gap has not been closed, as the needs estimates have continued to increase. As such, an analysis of this topic (i.e., current rate-setting practices) may be instructive for policymakers, particularly in light of the scale of need in the seventh survey and deliberations over the federal role in supporting such needs.

Another question for policymakers might involve whether water systems' ability to invest in needed projects or establish rates that cover the full cost of providing service is affected by customer affordability concerns. Such concerns could result in water rates set at levels below those needed to operate sustainably. Under IIJA Section 50108, Congress has directed EPA to

[82] CRS Report R47474, *Clean Water State Revolving Fund Allotment Formula: Background and Options*, by Jonathan L. Ramseur, contains more details on the allotment of funds. The Clean Water Act requires a needs survey but directs EPA to allot Clean Water State Revolving Fund capitalization grants based on a statutory formula rather than the results of the needs survey.

[83] **Appendix C** contains state-by-state details.

[84] See more in CRS Report R47633, *The Role of Earmarks in CWSRF and DWSRF Appropriations in the 117th Congress*, by Elena H. Humphreys.

[85] For the American Recovery and Reinvestment Act (ARRA; P.L. 111-5) supplemental appropriations for the DWSRF, Texas received a higher percentage than California.

[86] EPA, *The Clean Water and Drinking Water Infrastructure Gap Analysis*.

collect some information to assess the state of water system financial sustainability. Given the most recent survey, congressional debate regarding the increasing drinking water infrastructure needs, and which needs to support, is likely to continue, as are questions regarding the alignment of the needs survey to congressional priorities, and over the reliability of the data used to estimate needs.

Appendix A. Selected Differences in Survey Methods

Table A-1. Selected Differences in Drinking Water Infrastructure Needs Surveys

	Notes
First Survey *Survey in 1995; Published in 1997*	Excluded nonprofit noncommunity water systems (NPNCWS) Included dam/raw water reservoir projects Survey of "large" community water systems (CWS) that serve more than 50,000 people Sample of "medium" CWS that serve 3,301 to 50,000 people Site visits to a sample of "small" CWS that serve 3,300 or fewer people
Second Survey *Survey in 1999; Published in 2001*	Aligned surveyed needs to Drinking Water State Revolving Fund (DWSRF) eligibilities • Dams/raw water reservoirs excluded • Site visits to a sample NPNCWS
Third Survey *Survey in 2003; Published in 2005*	Changed questionnaire to better capture long-term replacement/rehabilitation projects Projected small CWS and NPNCWS costs based on site visits from 1999 survey
Fourth Survey *Survey in 2007; Published in 2009*	Changed threshold between large and medium CWS • Large CWS serve more than 100,000 people • Medium CWS serve 3,301 to 100,000 people Site visits to a sample of small CWS that serve 3,300 or fewer people Projected NPNCWS costs based on site visits from 1999 survey Option for states that receive the minimum DWSRF allotment of 1% to survey only large CWS
Fifth Survey *Survey in 2011; Published in 2013*	Projected small CWS costs based on site visits from 2007 survey; projected NPNCWS costs based on site visits from second survey
Sixth Survey *Survey in 2015; Published in 2018*	Similar to 2011 survey, resampled a percentage of the 2011 survey's medium systems Projected small CWS costs based on site visits from 2007 survey; projected NPNCWS costs based on site visits from 1999 survey
Seventh Survey *Survey in 2021; Published in 2023*	Included estimates of lead service lines Site visits to a sample of small CWS that serve 3,300 or fewer people and NPNCWS

Source: EPA, *Drinking Water Infrastructure Needs Survey: First Report to Congress*, 1997; EPA, *Drinking Water Infrastructure Needs Survey: Second Report to Congress*, 2001; EPA, *Drinking Water Infrastructure Needs Survey: Third Report to Congress*, 2005; EPA, *Drinking Water Infrastructure Needs Survey and Assessment: Fourth Report to Congress*, 2009; EPA, *Drinking Water Infrastructure Needs Survey and Assessment: Fifth Report to Congress*, 2013; EPA, *Drinking Water Infrastructure Needs Survey and Assessment: Sixth Report to Congress*, 2018; and EPA, *Drinking Water Infrastructure Needs Survey and Assessment: Seventh Report to Congress*, 2023.

Appendix B. Safe Drinking Water Act (SDWA) Regulatory Compliance Needs

Table B-1. Estimated 20-Year Costs Needed to Comply with SDWA Regulations

(in billions, adjusted to 2022 dollars)

	First Survey	Second Survey	Third Survey	Fourth Survey	Fifth Survey	Sixth Survey
Microbiological Contaminant Compliance Costs	$26.4	$52.9	$70.0	$52.3	$38.7	$48.4
Chemical Contaminant Compliance Costs	$4.9	$20.7	$24.6	$30.0	$20.9	$25.7
Total SDWA Regulatory Need	$31.4	$73.5	$94.6	$82.3	$59.6	$74.1
Percent of Total Need	9%	21%	16%	16%	11%	12%

Source: Calculated by CRS from EPA, *Drinking Water Infrastructure Needs Survey: First Report to Congress*, 1997; EPA, *Drinking Water Infrastructure Needs Survey: Second Report to Congress*, 2001; EPA, *Drinking Water Infrastructure Needs Survey: Third Report to Congress*, 2005; EPA, *Drinking Water Infrastructure Needs Survey and Assessment: Fourth Report to Congress*, 2009; EPA, *Drinking Water Infrastructure Needs Survey and Assessment: Fifth Report to Congress*, 2013; EPA, *Drinking Water Infrastructure Needs Survey and Assessment: Sixth Report to Congress*, 2018; and the U.S. Bureau of Economic Analysis (BEA), "Table 5.9.4. Price Indexes for Gross Government Fixed Investment by Type," accessed October 17, 2023.

Notes: FY2022 dollars calculated using price index data from line 42, "water systems," of BEA Table 5.9.4. These totals include Indian tribe and Alaska Native village compliance costs. EPA did not provide analogous information in the seventh report.

Appendix C. Annual Estimated Infrastructure Needs by State from EPA's Needs Surveys

Table C-1. Annual Estimated Drinking Water Infrastructure Needs, by State

(in billions of 2022 dollars)

	First Survey	Second Survey	Third Survey	Fourth Survey	Fifth Survey	Sixth Survey	Seventh Survey
AL	$2.15	$1.27	$1.77	$3.25	$5.66	$7.24	$6.32
AK	$1.00	$0.69	$0.72	$0.64	[a]	[a]	$0.71[a]
AZ	$1.75	$1.91	$9.57	$5.88	$5.29	$5.87	$6.25
AR	$2.62	$1.81	$3.71	$4.19	$4.34	$4.74	$3.99
CA	$24.38	$20.60	$29.25	$30.97	$31.67	$32.82	$43.35
CO	$2.53	$2.98	$5.59	$5.08	$5.07	$6.55	$6.26
CT	$1.76	$1.19	$0.69	$1.11	$2.55	$2.58	$2.55
DE	$0.17	$0.36	$0.25	[a]	[a]	[a]	$0.94[a]
FL	$5.62	$4.39	$15.79	$10.17	$11.72	$14.07	$13.89
GA	$4.27	$2.83	$9.46	$7.09	$6.59	$8.01	$10.20
HI	$0.56	$0.17	$0.85	[a]	[a]	[a]	$1.20[a]
ID	$0.76	$0.61	$0.76	[a]	[a]	[a]	$1.60[a]
IL	$6.93	$7.24	$14.17	$11.91	$13.51	$13.45	$11.53
IN	$2.17	$1.99	$4.23	$4.71	$4.66	$4.84	$6.12
IA	$2.92	$3.35	$3.68	$4.85	$4.22	$5.05	$5.25
KS	$2.56	$1.94	$2.03	$3.20	$2.98	$3.42	$3.65
KY	$2.88	$2.08	$2.95	$3.95	$4.43	$5.29	$4.07
LA	$2.53	$1.50	$4.31	$5.47	$3.79	$4.71	$4.68
ME	$1.12	$0.59	$0.87	[a]	$0.84	$0.87	$1.02[a]
MD	$1.66	$1.97	$4.16	$4.32	$4.92	$6.00	$7.60
MA	$7.70	$6.92	$8.98	$5.39	$5.48	$7.87	$7.89
MI	$5.75	$8.00	$11.87	$9.39	$9.83	$8.39	$8.44
MN	$3.16	$3.65	$5.73	$4.75	$5.24	$4.83	$5.28
MS	$2.04	$1.60	$1.73	$2.57	$2.62	$3.10	$4.21
MO	$2.43	$2.57	$6.25	$5.62	$6.03	$5.74	$5.76
MT	$0.86	$1.03	$0.83	[a]	[a]	[a]	$1.21[a]
NE	$1.23	$0.98	$1.42	$1.41	[a]	[a]	$1.68[a]
NV	$0.68	$0.71	$0.96	$2.13	$3.98	$3.42	$3.33
NH	$0.93	$0.59	$0.63	$0.00	$0.00	$0.00	$1.28[a]

	First Survey	Second Survey	Third Survey	Fourth Survey	Fifth Survey	Sixth Survey	Seventh Survey
NJ	$4.68	$4.31	$7.26	$6.31	$5.63	$5.52	$6.36
NM	$1.35	$1.23	$0.97	[a]	[a]	[a]	$1.72[a]
NY	$13.06	$15.49	$15.55	$21.52	$15.68	$14.64	$18.24
NC	$3.52	$3.19	$11.52	$7.98	$7.15	$10.75	$10.38
ND	$0.76	$0.58	$0.64	[a]	[a]	[a]	$1.64[a]
OH	$6.36	$5.84	$10.16	$9.99	$8.67	$8.62	$8.34
OK	$2.63	$2.76	$5.04	$3.26	$4.62	$4.41	$5.04
OR	$2.78	$3.19	$4.48	$2.21	$3.96	$4.02	$5.25
PA	$6.16	$6.19	$11.53	$9.03	$10.12	$10.79	$12.61
PR	$2.92	$2.32	$2.39	$2.01	$2.29	$2.38	$1.90
RI	$0.85	$0.68	$0.42	[a]	[a]	[a]	$0.95[a]
SC	$1.89	$0.97	$1.31	$1.29	[a]	$3.94	$4.20
SD	$0.74	$0.52	$1.04	[a]	[a]	[a]	$1.13[a]
TN	$2.42	$1.66	$2.91	$2.81	$1.92	$5.64	$5.98
TX	$16.02	$15.39	$29.57	$20.73	$24.11	$29.04	$31.79
UT	$1.35	$0.61	$0.74	[a]	$2.65	$2.80	$2.72[a]
VT	$0.60	$0.36	$0.41	[a]	[a]	[a]	$0.92[a]
VA	$3.81	$2.42	$3.01	$4.81	$4.78	$5.23	$4.87
WA	$5.22	$4.65	$7.00	$7.74	$6.77	$7.54	$8.47
WV	$1.41	$1.20	$0.90	[a]	[a]	[a]	$2.37[a]
WI	$2.42	$3.65	$6.23	$4.91	$5.08	$5.51	$6.10
WY	$0.51	$0.52	$0.31	[a]	[a]	[a]	$0.82[a]

Source: CRS analysis from EPA, *Drinking Water Infrastructure Needs Survey: First Report to Congress*, 1997; EPA, *Drinking Water Infrastructure Needs Survey: Second Report to Congress*, 2001; EPA, *Drinking Water Infrastructure Needs Survey: Third Report to Congress*, 2005; EPA, *Drinking Water Infrastructure Needs Survey and Assessment: Fourth Report to Congress,* 2009; EPA, *Drinking Water Infrastructure Needs Survey and Assessment: Fifth Report to Congress*, 2013; EPA, *Drinking Water Infrastructure Needs Survey and Assessment: Sixth Report to Congress*, 2018; and EPA, *Drinking Water Infrastructure Needs Survey and Assessment: Seventh Report to Congress*, 2023; and the U.S. Bureau of Economic Analysis (BEA), "Table 5.9.4. Price Indexes for Gross Government Fixed Investment by Type," accessed October 17, 2023.

Notes: EPA's needs surveys provide estimated drinking water infrastructure needs over a 20-year period. This table presents each needs survey's annual estimated needs by state. FY2022 dollars calculated using price index data from line 42, "water systems," of BEA Table 5.9.4. This table includes estimated needs for states and Puerto Rico.

a. Indicates a partial participation state. These states receive the 1% minimum DWSRF allotment and chose not to conduct the survey for medium water systems. For the seventh survey, EPA calculated medium system needs in these states based on average medium system needs nationally. EPA did not calculate state-level needs for the partial participation states in the fourth through sixth surveys.

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