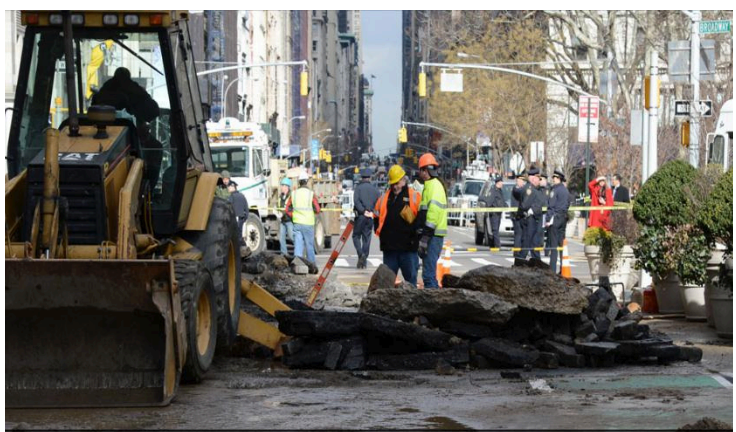
At the dawn of the 21st century, much of our drinking water infrastructure is nearing the end of its useful life. There are an estimated 240,000 water main breaks per year in the United States. Assuming every pipe would need to be replaced, the cost over the coming decades could reach more than $1 trillion, according to the American Water Works Association (AWWA). The quality of drinking water in the United States remains universally high, however. Even though pipes and mains are frequently more than 100 years old and in need of replacement, outbreaks of disease attributable to drinking water are rare.

Drinking Water: Conditions & Capacity

Nearly 170,000 public drinking water systems are located across the United States. Of these, 54,000 are community water systems that collectively serve more than 264 million people.



Crews work to pump water from the New York City metro track bed and restore N, Q and R train service after a 36-inch water main broke at 23rd Street and Broadway in February 2013.
Courtesy of MTA New York City Transit / Marc Hermann

Although new pipes are being added to expand service areas, drinking-water systems degrade over time, with the useful life of component parts ranging from 15 to 95 years. Especially in the country's older cities, much of the drinking water infrastructure is old and in need of replacement. Failures in drinking water infrastructure can result in water disruptions, impediments to emergency response, and damage to other types of infrastructure. Broken water mains can damage roadways and structures and hinder fire-control efforts. Unscheduled repair work to address emergency pipe failures may cause additional disruptions to transportation and commerce.

It is estimated that more than one million miles of water mains are in place in the United States. The conditions of many of these pipes are unknown, as they are buried underground out of sight, and owned and operated by various local entities. Some pipes date back to the Civil War era and often are not examined until there is a problem or a water main break. These breaks are becoming more common, as there are an estimated 240,000 water main breaks per year in the United States.

SAFE DRINKING WATER ACT APPRORIATIONS

FISCAL YEAR	TOTAL STATE REGULATED HIGH HAZARD POTENTIAL DAMS
FY 2008	$0.84 BILLION
FY 2009	$2.83 BILLION
FY 2010	$1.39 BILLION
FY 2011	$0.96 BILLION
FY 2012	$0.917 BILLION
TOTAL	$6.94 BILLION

Determining pipe condition through cost-effective structural assessment will allow worst-condition pipes to be addressed first, avoiding potential failures and associated risks, damages, and costs. These structural condition assessments will also help avoid premature replacement of structurally sound pipes to save resources and time. As a result of these benefits, demand for and value from these assessments is expected to increase significantly over the next 20 years.

The Environmental Protection Agency (EPA) estimates that approximately 4,000 to 5,000 miles of drinking water mains are replaced annually. The annual replacement rate is projected to peak around 2035 at 16,000 to 20,000 miles of aging pipe replaced each year. Meanwhile, pipes installed during the middle of the 20th century are likely to begin to fail in large numbers.

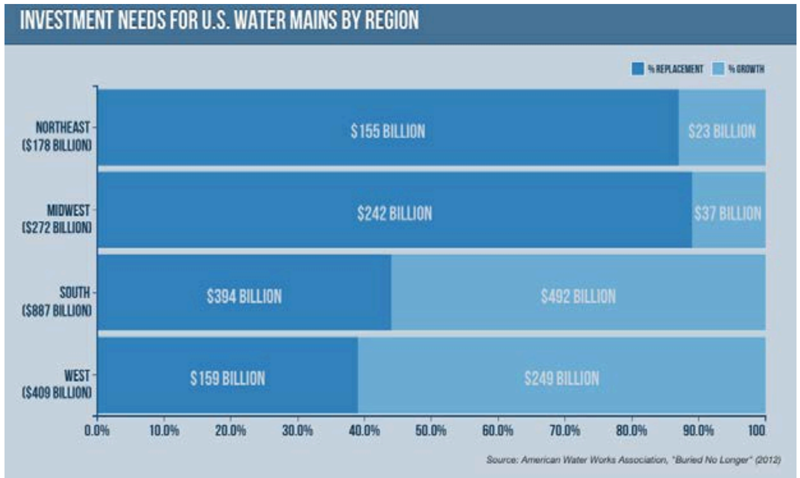
There are other pressures on the nation's drinking water systems that impact the cost of infrastructure. Financial impacts of meeting regulatory requirements are a continuing issue for many communities. In the case of drinking water systems, the most pressing rules are new, either recently issued or pending, as the result of standard setting by the EPA to implement the Safe Drinking Water Act Amendments of 1996. These rules impose new or stricter drinking water limits on numerous contaminants, including arsenic, radioactive contaminants, and microbials and disinfection byproducts, among others. Funding has remained the same, often requiring localities to put less toward routine maintenance.

NATIONAL 20-YEAR WATER INVESTMENT NEEDS

SYSTEM SIZE AND TYPE	NEED
LARGE COMMUNITY WATER SYSTEMS SERVING 100,000 OR MORE PERSONS	$116.3 BILLION
MEDIUM COMMUNITY WATER SYSTEMS SERVING 3,301 TO 100,000 PERSONS	$145.1 BILLION
SMALL COMMUNITY WATER SYSTEMS SERVING 3,300 AND FEWER PERSONS	$59.4 BILLION
NONPROFIT COMMUNITY WATER SYSTEMS	$4.1 BILLION
TOTAL STATE NEEDS	$324.9 BILLION
NATIVE AMERICAN AND ALASKAN NATIVE VILLAGE WATER SYSTEMS	$2.9 BILLION
COSTS ASSOCIATED WITH PROPOSED AND ADOPTED SAFE DRINKING WATER ACT RULES	$7 BILLION
TOTAL NATIONAL NEEDS	$334.8 BILLION

Source: Environmental Protection Agency, 2007 Drinking Water Infrastructure Needs Survey and Assessment (In Billions of 2007 Dollars)

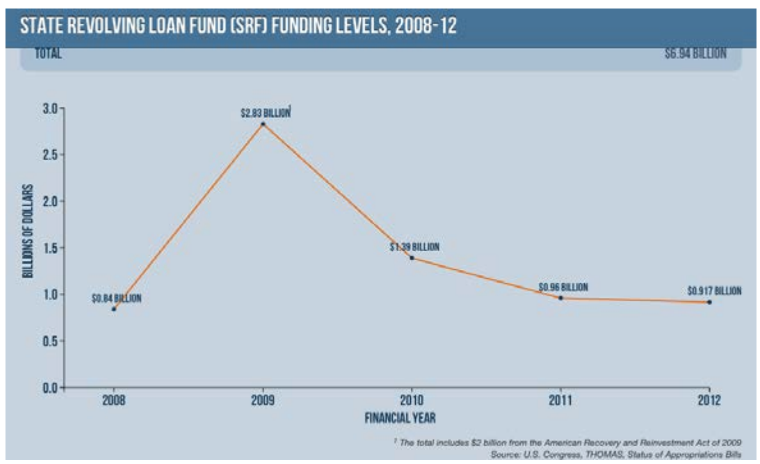
Drinking Water: Investment & Funding



In 2012, the American Water Works Association (AWWA) concluded that the aggregate replacement value for more than one million miles of pipes was approximately $2.1 trillion if all pipes were to be replaced at once. Since not all pipes need to be replaced immediately, it is estimated that the most urgent investments could be spread over 25 years at a cost of approximately $1 trillion.

"The need will double from roughly $13 billion a year today to almost $30 billion (in 2010 dollars) annually by the 2040s, and the cost will be met primarily through higher water bills and local fees.

"Delaying the investment can result in degrading water service, increasing water service disruptions, and increasing expenditures for emergency repairs. Ultimately we will have to face the need to 'catch up' with past deferred investments, and the more we delay the harder the job will be when the day of reckoning comes."



By 2050, the aggregate investment needs would total more than $1.7 trillion, according to the AWWA.

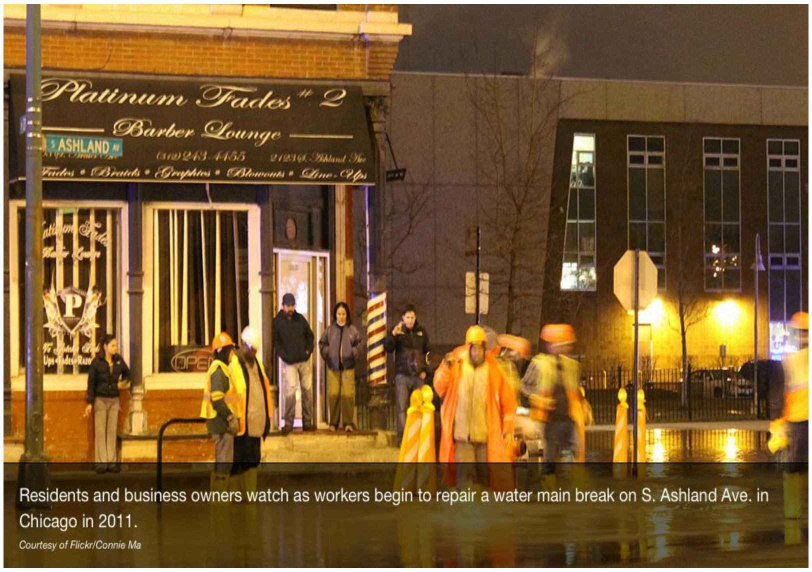
By contrast, the Environmental Protection Agency (EPA) needs estimates are more conservative as they do not factor in population growth. Their results in 2007 found a 20-year capital investment need of almost $334.8 billion for approximately 53,000 community water systems and 21,400 not-for-profit noncommunity water systems (including schools and churches). Among the major necessary investments, the nation required $199 billion for transmission and distribution systems, $67 billion for treatment systems, and $39 billion for water storage.

The needs are greater than $1,000 per person in five regions: Far West, Great Lakes, Mid-Atlantic, Plains, and Southwest. Capital spending has not kept pace with needs for water infrastructure. The trend toward state and local governments' assuming the bulk of the investment requirements in the coming decades will continue, with local governments' paying an increasing share of the costs. In 2008, state and local governments estimated their total expenditures at $93 billion annually for wastewater and drinking water infrastructure.

Congressional appropriations have declined over the five-year period 2008 to 2012, totaling only $6.9 billion—an average of $1.38 billion annually or $27.6 billion over 20 years, 8% of EPA's identified needs over 20 years.

Drinking Water: Success Stories

Chicago Department of Water Management Ten-Year Plan

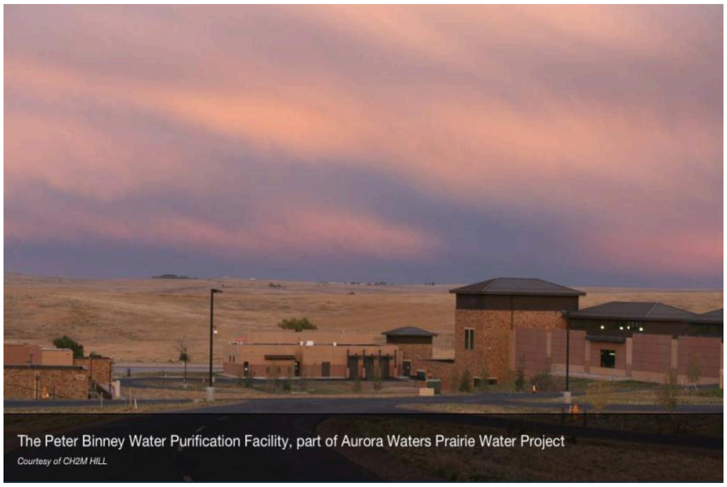


Residents and business owners watch as workers begin to repair a water main break on S. Ashland Ave. in Chicago in 2011.
Courtesy of Flickr/Connie Ma

The Chicago Department of Water Management delivers almost one billion gallons of fresh water to the residents of Chicago and 125 suburban communities every day. But many of Chicago's water mains are more than 100 years old. The city has replaced about 30 miles of water mains a year in recent years. That pace is not nearly quick enough, given that Chicago put down about 75 miles of mains a year between 1890 and 1920, and that those pipes were not expected to serve for more than a century. In 2012, the city embarked on a 10-year plan to replace 900 miles of century-old drinking water pipes. The program will finance the replacement of approximately 90 miles of aging pipes annually.

The city planned ahead and used a variety of financing mechanisms to launch the program. Water revenues have risen over the past 10 years due to rate increases from 2008 to 2010. Water and sewer fees generated almost $650 million for City Hall last year. By cutting the payroll of the Water Management Department, the city has kept operating expenses stable at about $250 million a year. By increasing revenues and keeping costs stable, another $225 million a year has been invested in upgrading the water system and sewers.

Prairie Waters Project in Aurora, Colorado


The Peter Binney Water Purification Facility, part of Aurora Waters Prairie Water Project
Courtesy of CH2M HILL

The Riverbank Filtration Tunnel and Pump Station project at the B.E. Payne Treatment Plant in Louisville, Kentucky, was developed to exceed new regulations required by the Safe Drinking Water Act that will take effect in 2012. Riverbank filtration is a "green supply" purification process that uses the natural filtering processes of the riverbank to remove many of the particles and contaminants from the raw river water, which produces 70 million gallons of clean water each day. The Louisville Water Company is the first water utility in the world to combine a gravity tunnel with wells as a source for drinking water.

This $55 million-dollar project was designed to save money because the naturally filtered water requires less treatment and the stable water temperature results in fewer water main breaks. Water from the Ohio River is filtered through the natural sand and gravel of the riverbank and then is pumped into the plant for additional treatment. This filtration process improves public safety by reducing risks associated with hazardous chemical spills and removing herbicides, pathogens, and pesticides in the water.

Planners also worked closely with the local community to find a solution that would preserve the aesthetics of the neighborhood. Since River Road is part of a National Scenic Byway with historic homes along the river, the decision to use a deep underground tunnel to collect the water as opposed to above-ground wells was important.

Riverbank Filtration Tunnel and Pump Station in Louisville, Kentucky

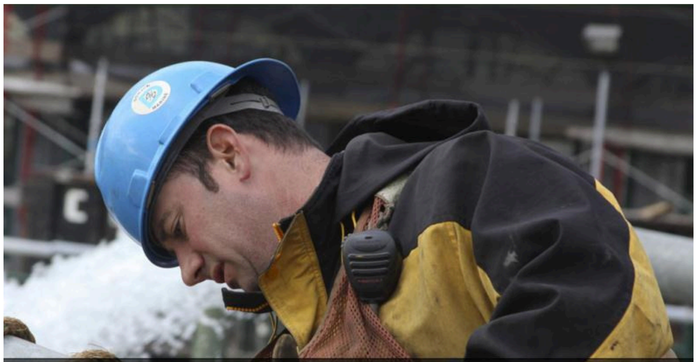
The Riverbank Filtration Tunnel and Pump Station project at the B.E. Payne Treatment Plant in Louisville, Kentucky, was developed to exceed new regulations required by the Safe Drinking Water Act that will take effect in 2012. Riverbank filtration is a "green supply" purification process that uses the natural filtering processes of the riverbank to remove many of the particles and contaminants from the raw river water, which produces 70 million gallons of clean water each day. The Louisville Water Company is the first water utility in the world to combine a gravity tunnel with wells as a source for drinking water.

This $55 million-dollar project was designed to save money because the naturally filtered water requires less treatment and the stable water temperature results in fewer water main breaks. Water from the Ohio River is filtered through the natural sand and gravel of the riverbank and then is pumped into the plant for additional treatment. This filtration process improves public safety by reducing risks associated with hazardous chemical spills and removing herbicides, pathogens, and pesticides in the water.

Workers setting the tunnel lining during the Riverbank Filtration Tunnel and Pump Station project
Courtesy of Louisville Water

Planners also worked closely with the local community to find a solution that would preserve the aesthetics of the neighborhood. Since River Road is part of a National Scenic Byway with historic homes along the river, the decision to use a deep underground tunnel to collect the water as opposed to above-ground wells was important.

New York City Department of Environmental Protection Capital Improvement Program


Construction worker secures pipes during work on City Water Tunnel No. 3
Courtesy of U.S. Army Corps of Engineers

With one of the oldest water systems in the nation, New York City is carrying out the largest construction project in the city's history to maintain and improve the city's water system. Approximately $21 billion has been allocated for water system capital projects, including $2.5 billion invested and committed to City Water Tunnel No. 3.

The city also has acquired nearly 79,000 acres of land upstate to protect the city's watershed, allowing New York City to remain one of only five large cities in the country to obtain the majority of its water from unfiltered sources. The city also invested in a new filtration plant and a disinfection facility which will provide an extra level of drinking water protection for water from the Catskill and Delaware watersheds. The program also includes funding for upgrading the city's 14 wastewater treatment plants and reducing combined sewer overflows, which has helped bring harbor water quality to an all-time high since testing began 100 years ago and allowed wastewater treatment plants to meet the federal Clean Water Act's secondary treatment standards for the first time ever.

Glendale Water Improvement Project in Reno, Nevada

The city of Reno, Nevada, had an outdated water system that included a diversion made from rock and concrete rubble which leaked, forcing the city to temporarily install pumps in order to help ensure adequate water during peak times. During dry years or droughts, operations personnel had to pump the river and seal the existing structure with plastic sheeting and sand bags, requiring the undesirable use of heavy equipment in the river channel. Even with these measures, the system still lost valuable water during drought years that could otherwise have been used if a more reliable structure was in place. The system was also prone to severe damage during flooding and made for difficult access for both recreational users — boaters and swimmers — and fish.

The Glendale Water Improvement Project, completed in 2011, replaced the river diversion into the plant with full capture of water, allowing the plant to operate at its full potential. The diversion is located just upstream of the Glendale bridge, southwest of the intersection of Glendale Avenue and Galletti Way.

Drinking Water: Conclusion

America's drinking water systems are aging and must be upgraded or expanded to meet increasing federal and state environmental requirements that add to the funding crisis. Not meeting the investment needs of the next 20 years risks reversing the environmental, public health, and economic gains of the last three decades.

In all likelihood, businesses and households will be forced to adjust to unreliable water delivery by strengthening sustainable practices employed in production and daily water use. The solutions already being put forward and implemented in the United States and abroad include voluntary limitations or imposed regulations governing the demand for water, as well as technologies that recycle water for industrial and residential purposes (e.g., using recycled shower water for watering lawns). These types of policies have reduced the demand for water and therefore have lessened the impacts on existing infrastructure.

Raising the Grades: Solutions that Work Now

- **Raise awareness for the true cost of water.** Current water rates do not reflect the true cost of supplying clean, reliable drinking water. Replacing the nation's antiquated pipes will require significant local investment, including higher water rates.
- **Reinvigorate the State Revolving Loan Fund (SRF) program** under the Safe Drinking Water Act by reauthorizing minimum federal funding of $7.5 billion over five years
- **Eliminate the state cap on private activity bonds for water infrastructure** projects to bring an estimated $6 billion to $7 billion annually in new private financing to bear on the problem
- **Explore the potential for a Water Infrastructure Finance Innovations Authority** (WIFIA) that would access funds from the U.S. Treasury at Treasury rates and use those funds to support loans and other credit mechanisms for water projects. The loans would be repaid to the Authority and then to the U.S. Treasury with interest
- **Establish a federal Water Infrastructure Trust Fund** to finance the national shortfall in funding of infrastructure systems under the Clean Water Act and the Safe Drinking Water Act

SCAN THIS QR CODE TO GET THE REPORT CARD