Value of Water
CAMPAIGN

The Economic Benefits of Investing in Water Infrastructure

About the Value of Water Campaign

The Value of Water Campaign educates and inspires the nation about how water is essential, invaluable, and in need of investment. Spearheaded by top leaders in the water industry, and coordinated by the US Water Alliance, the Value of Water Campaign is building public and political will for investment in America's water and wastewater infrastructure through best-in-class communications tools, high-impact events, media activities, and robust research and publications.

The campaign is supported by a diverse group of leaders in the water industry, including:

Alexandria Renew Enterprises
American Society of Civil Engineers
American Water
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Association of Metropolitan Water Agencies
Atlanta Department of Watershed Management
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The Economic Benefits of Investing in Water Infrastructure

Purpose of the Report

The Value of Water Campaign commissioned an economic impact analysis to understand how increasing investments in the nation's water infrastructure can affect economic growth and employment. The study reviews the projected capital needs of water, wastewater, and stormwater utilities, and estimates the associated economic benefits that would be realized if the nation chose to make these investments. These benefits include the economic opportunities created by water infrastructure projects, the long-term productivity savings to the customers of water utilities, as well as the avoided costs of frequent disruptions in water and wastewater service to business. Because many sectors are reliant on water, a disruption of water and wastewater service, even for one day, can cost businesses significant amounts of revenue and almost instantly shrink the annual national Gross Domestic Product (GDP).

The analysis builds on a previous report, "National Economic and Labor Impacts of the Water Utility Sector," published by the Water Research Foundation and the Water Environment Research Foundation, which evaluates the economic contributions of 30 of the nation's largest water and wastewater utilities serving 25 percent of the nation's population.

Introduction

Water is essential to all aspects of life. Water sustains families and communities. It supports economic productivity. From semiconductor manufacturing, to agriculture, to hotels and restaurants, virtually all sectors of the economy rely on water.

In this report, the term "water infrastructure" is used to encompass the structures and facilities that are operated by water, wastewater, and stormwater utilities, both public and investor-owned. These may include important infrastructure assets such as pipes, pumps, treatment plants, and more. In the US, approximately 52,000 water systems deliver drinking water to homes and businesses and approximately 16,000 centralized treatment plants collect and treat wastewater so it can be recycled or returned to the environment (EPA 2016b, Shifrin 2014). Many wastewater utilities also manage stormwater either through combined systems that handle both stormwater and wastewater, or separate stormwater systems. While publicly-owned utilities serve most homes and businesses, investor-owned utilities also play an important role, directly serving 50 million Americans and making up 15 percent of the US municipal water sector based on population served (Bluefield Research 2016).

Many of the nation's water and wastewater systems have been in operation for a century or more. As pipes, pumps, and plants reach the end of their expected lifespan, water infrastructure capital needs are growing rapidly, yet investment in water infrastructure is not keeping pace. Based on a 2016 assessment by the American Society of Civil Engineers (ASCE), this study estimates that the US needs to invest an additional $82 billion per year in water infrastructure at all levels of government over the next 10 years to meet projected capital needs.

If the estimated investment gap were closed, it would result in **over $220 billion** in total annual economic activity to the country. These investments would generate and sustain approximately **1.3 million jobs** over the 10-year period.

Furthermore, the value of safe provision, delivery, and treatment of water to customers results in significant avoided costs for businesses that would otherwise have to provide their own water supplies. These investments would save US businesses approximately **$94 billion a year** in sales in the next 10 years and as much as **$402 billion a year** from 2027 to 2040.

The US is funding just **one-third of its water infrastructure needs.**

Current national capital need: $123 billion per year

Water utilities serve 86 percent of the national population and provide approximately half of the freshwater used by commercial and industrial businesses (USGS 2014). On a daily basis, water utilities distribute 42 billion gallons of clean water (USGS 2014). Wastewater utilities serve 75 percent of the population while collecting and treating 32 billion gallons of wastewater daily (Shifrin 2014). Providing this scale of service requires significant ongoing capital investment to repair or replace the distribution lines, conveyance systems, treatment plants, and storage tanks that keep water, wastewater, and stormwater systems working.

Currently, capital needs of water, wastewater, and stormwater utilities are on the rise as infrastructure built decades ago nears the end of its useful life. Based on ASCE's estimates of water infrastructure needs (ASCE 2016), the US needs to invest a minimum of $123 billion per year in water infrastructure over the next 10 years (in current 2016 dollars) to achieve a good state of repair.

Projected capital needs are distributed throughout the nation with 23 percent of needs reported in the Midwest, 20 percent in the Northeast, 23 percent in the West and 34 percent in the South (see Figure 1). Note that capital needs presented in this report **represent the minimum investment required** to bring water, wastewater, and stormwater systems to a state of good repair. They do not account for costs associated with adding capacity in high-growth regions, responding to natural disasters, or developing new sources of water.

Investment needs grow as water infrastructure reaches the end of its lifespan

The reason for the surge in nationwide replacement needs can be explained by the timing, lifespan, and design of investments in water infrastructure over the last century. With a lifespan of 75 to 100 years, much of the nation's underground pipes are due for replacement. Based on analysis by the American Water Works Association (2011), approximately one-third of water mains nationwide will require replacement by 2040. As an indication of mounting needs, water mains currently experience an estimated 240,000 breaks per year (ASCE 2013). Wastewater systems face distinct, but equally pressing challenges. Many wastewater systems built in the first half of the twentieth century were designed to collect stormwater and wastewater as part of a single, combined system. During storm conditions, combined systems can overflow, causing untreated wastewater and stormwater to enter waterways. Every year, 900 billion gallons of untreated wastewater and stormwater are released to water bodies without being treated (Galavotti 2015). As a result of greater frequency and intensity of storm events in many communities, combined sewer systems have become even more susceptible to overflows.

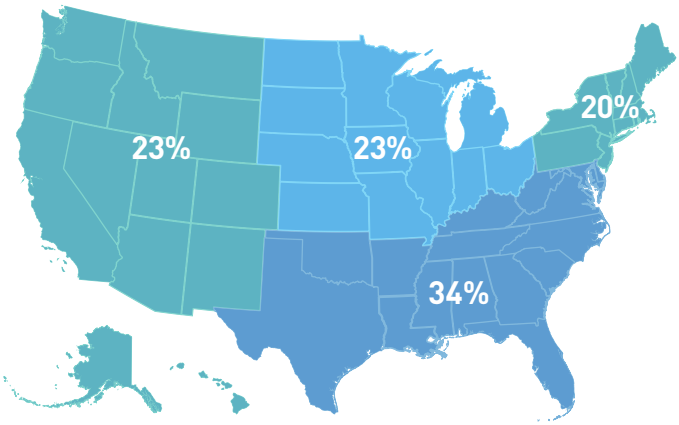
National investment gap: $82 billion per year

Aggregate capital spending on water infrastructure at the local, state, and federal level currently totals $41 billion per year—significantly below the minimum annual need. Without additional investment, only one-third of capital needs will be funded over the next ten years, representing an annual funding gap of $82 billion per year. If current needs are left unaddressed, the annual gap is projected to rise to $109 billion by 2026 and $153 billion by 2040, as needs from prior years accumulate (see Figure 2).

The US needs to invest a total of **$123 billion per year** in water infrastructure over the next 10 years (in current 2016 dollars) to achieve a good state of repair.

Figure 1

Regional Distribution of Capital Needs



Census Region	Share of Capital Needs
Midwest	23%
Northeast	20%
South	34%
West	23%
US Total	**100%**

Sources:

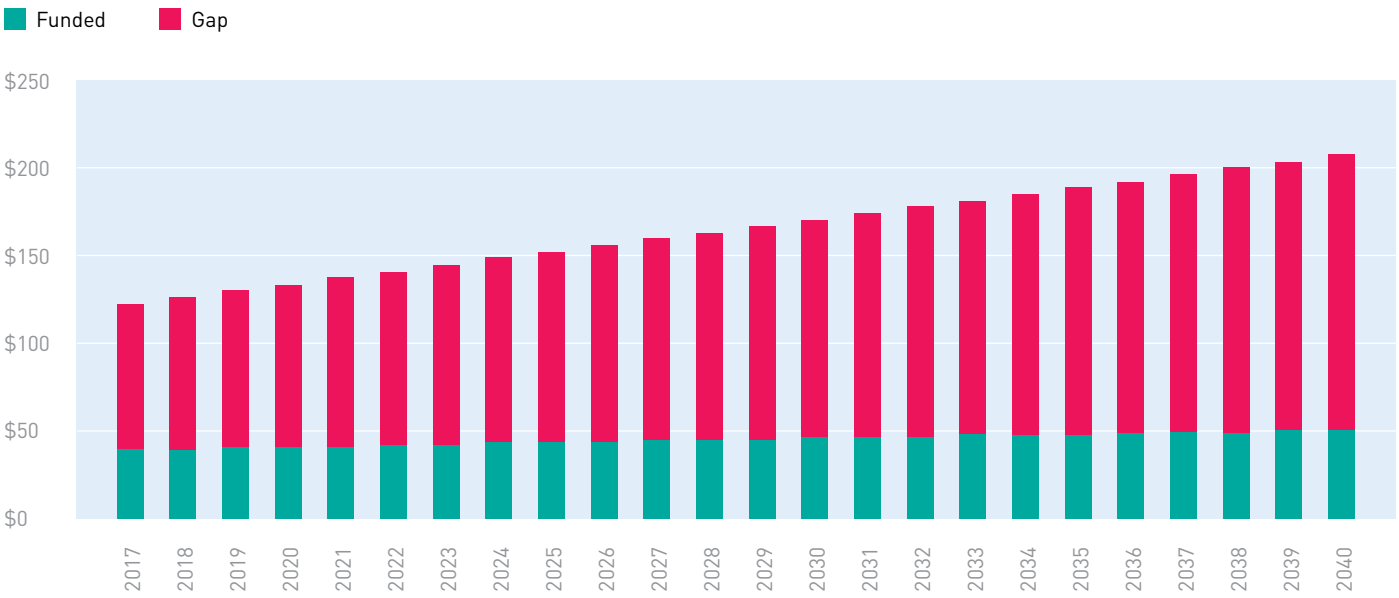
American Society of Civil Engineers. 2016. *Failure to Act: Closing the Infrastructure Investment Gap for America's Economic Future.*

Environmental Protection Agency. 2016. *Clean Watershed Needs Survey 2012. Report to Congress.*

Environmental Protection Agency. 2013. *Drinking Water Infrastructure Needs Survey and Assessment: Fifth Report to Congress.*

Figure 2

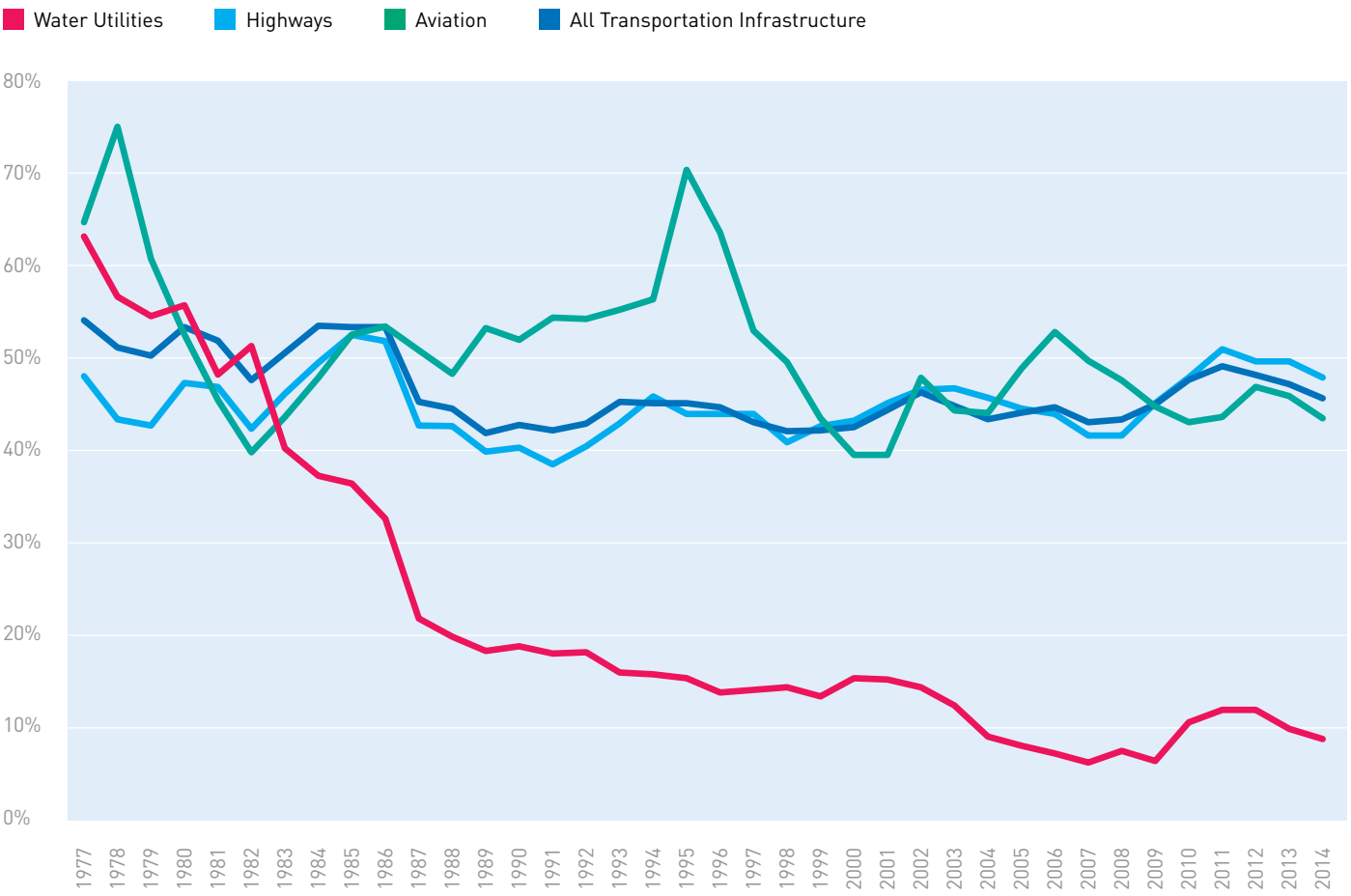
Projected Growth in Water and Wastewater Investment Gap If Current Investment Trends Continue (in $Billions)



Needs expressed in constant 2016 dollars. Source: ASCE 2016, BLS 2016.

Figure 3

Federal Contribution to Total Infrastructure Spending

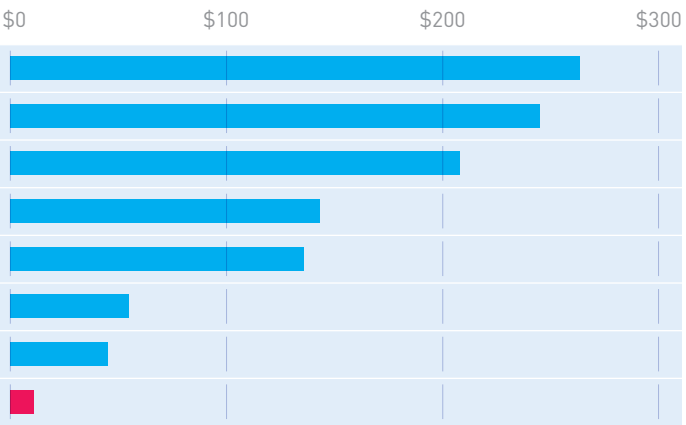


Source: CBO 2015.

Figure 4

Annual Federal Investment Per Capita

Recipient	Per Capita Federal Investment
IT Infrastructure (Federal Departments)	$251
Research & Development—Defense	$245
Research & Development—Civilan	$208
Higher Education Grants	$143
Highways	$136
Other Transportation Infrastructure	$55
Energy Infrastructure	$46
Water Infrastructure	$11



Values expressed in 2014 dollars. Source: CBO 2015, CBO 2013, GAO 2016.

The decline in federal investment

Meeting the water infrastructure gap requires greater investment at the local, state, and federal levels. The federal government was instrumental in the development of water infrastructure over the previous century. As the country assesses its 21st century water infrastructure demands, there is a need for meaningful federal investment.

Despite rising capital needs, the federal government's contribution to water infrastructure capital spending has fallen over the past 30 years from 63 percent of total capital spending in 1977 to nine percent of total capital spending in 2014. In terms of per capita spending on water infrastructure, federal spending has fallen from $76 per person in 1977 to $11 per person in 2014 (2014 dollars; CBO 2015). In contrast, over the same time period, the federal government's share of total public spending on transportation infrastructure (including highways, mass transit, and aviation) has stayed constant at approximately half of total capital spending, with the remainder coming from state and local sources (see Figure 3) (CBO 2015).

Today, the federal government dedicates far fewer resources to water infrastructure than it spends on a broad range of priorities, from research and development, to highways, to grants for higher education (see Figure 4). For example, the federal government spends approximately 24 times more upgrading and maintaining the information technology (IT) infrastructure of federal agencies than it does repairing the nation's water systems.

As federal support for water infrastructure has declined, local and state spending has increased to help meet capital needs. Per capita spending by local communities has more than doubled in real terms from $45 in 1977 to upwards of $100 per person in 2014 (2014 dollars). Despite increased contributions from water ratepayers, this report shows that funding for water infrastructure continues to fall far below capital needs. The following sections of this report highlight the economic benefits that can be achieved if all levels of government, along with the private sector, work together to close the funding gap.

Water infrastructure failures across the country—including water main breaks, flooding from overwhelmed stormwater systems, and damaged dam spillways—demonstrate the urgent need to reinvest.

The aggregate economic activity supported by water investments exceeds the **GDP of twenty-six states.**

Employment opportunities in water infrastructure sectors are stable, well-paying positions providing average wages above the national average.

The US economy would stand to gain **over $220 billion in annual economic activity** by meeting its water infrastructure needs.

Aggregate economic impact: $220 billion in annual economic activity and 1.3 million jobs

By closing the annual investment gap in water infrastructure, the national economy would stand to gain over $220 billion in annual economic activity and approximately 1.3 million jobs per year. The aggregate economic impact is comprised of the direct impact on the water infrastructure sector, as well as indirect and induced impacts that are generated by successive rounds of spending on goods and services in other sectors. By meeting the gap, the US economy stands to gain a total of $2.22 trillion in additional economic activity over the next 10 years.

The number of jobs supported annually by funding the water infrastructure gap is greater than the employed workforce in sixteen states including Mississippi (1.22 million), Nebraska (980,000), and New Hampshire (730,000). The aggregate economic activity supported by these investments exceeds the GDP of 26 states including Oregon ($217.6 billion), South Carolina ($201.0 billion), and Alabama ($199.7 billion).

Direct economic and employment impacts

Investment in water infrastructure creates economic opportunities for businesses directly involved in the design, engineering, and construction of water infrastructure. These establishments would directly support $82 billion in annual economic activity and approximately 500,000 jobs (see Figure 5). Employment opportunities in water infrastructure sectors are stable, well-paying positions providing an average wage of $63,000 per year—approximately 20 percent above the national average. Employment gains would be concentrated in construction-related occupations, many of which can be accessed with a high school diploma (IMPLAN 2015; AECOM 2014).

Indirect and induced economic impacts

Investment in water infrastructure generates additional economic benefits through spending by directly impacted firms and their employees. For example, construction businesses play a major role in the repair and replacement of water infrastructure. These businesses purchase machinery and equipment from manufacturers, which in turn demand primary materials from other suppliers. Concurrently, employees of these businesses purchase personal goods and services in retail, medical, and other sectors. In this way, the initial investment in water infrastructure "ripples" throughout the economy due to spending by interrelated industries (the "indirect effect") and employees (the "induced effect"). The indirect and induced effects of closing the water infrastructure gap would add $140 billion to national economic activity, and generate and sustain an additional 760,000 jobs over the ten-year period (see Figure 5).

Economic multiplier of meeting the investment gap

The aggregate employment impact per $1 million investment in water infrastructure is comparable to public investments in energy, health care, and transportation, and is greater than the impact generated by military spending and personal income tax cuts, as estimated by economic impact studies of these sectors. For every $1 million invested in water infrastructure, it is estimated that **upwards of fifteen jobs are generated** throughout the economy. Six direct jobs are generated to support the design and construction of water infrastructure, and nine additional jobs are sustained by the indirect and induced spending triggered by the original investment (see Figure 6 and Figure 7).

Figure 5

Economic Impact of Funding the Water Infrastructure Gap

	Aggregate Impact	Direct Impact	Indirect & Induced Impact
Annual Impact			
Employment	1.26 million jobs/year	500,000 jobs/year	760,000 jobs/year
Labor Income	$75 billion/year	$32 billion/year	$43 billion/year
Output	$222 billion/year	$82 billion/year	$140 billion/year
Cumulative Impact (10 Years)			
Labor Income	$750 billion	$320 billion	$430 billion
Output	$2,220 billion	$820 billion	$1,400 billion

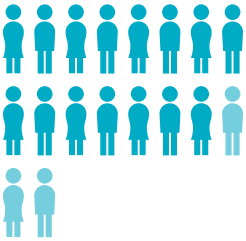
Impacts expressed in constant 2016 dollars. Source: IMPLAN 2015.

Figure 6

Jobs per $1 Million by Sector and Expenditure Type

Water Utilities
Capital

15–18 jobs



Hatch 2017, AECOM 2014, PA Consulting 2009

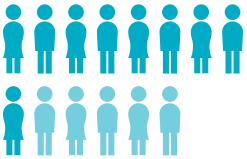
Military Spending
Operating & Capital

10–12 jobs

Heintz 2009, Heintz 2011

Personal Income Taxes
Spending

9–14 jobs



Heintz 2009, Heintz 2011, Hatch 2017

Energy
Capital

12–19 jobs

Heintz 2009

Health Care
Operating

16–17 jobs

Heintz 2011, Hatch 2017

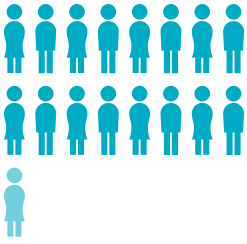
Education
Operating

24 jobs

Heintz 2011

Education
Capital

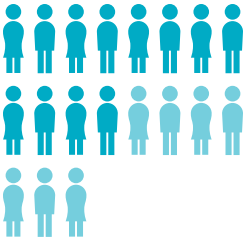
16–17 jobs



Heintz 2009

Energy (non-renewable)
Capital

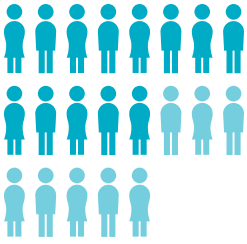
12–19 jobs



Heintz 2009

Transportation
Capital

13–21 jobs



Heintz 2009, Brun 2014, USDOT 2013

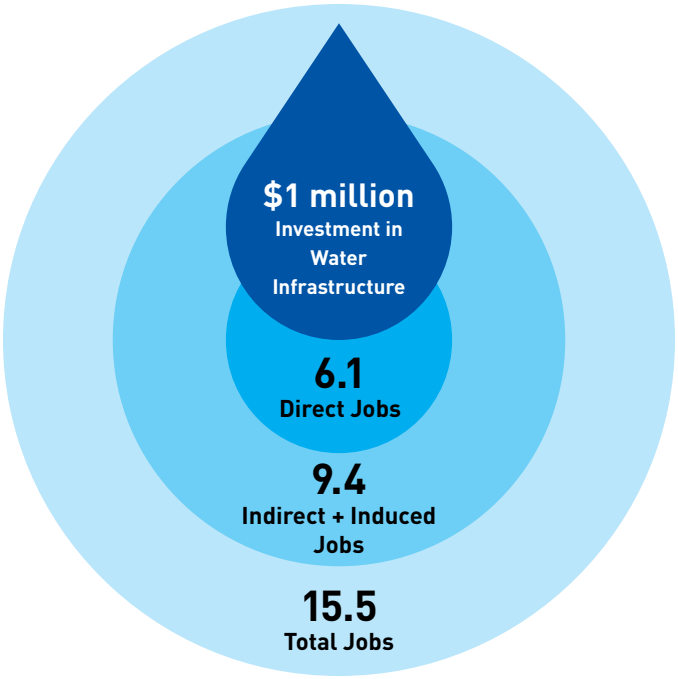
Values expressed in constant 2016 dollars.

Figure 7

Ripple Effect of Water Investment

	Jobs per $1 million
Direct Jobs	6.1
Indirect + Induced Jobs	9.4
Total Jobs	15.5

Impacts expressed in constant 2016 dollars. Source: IMPLAN 2015.



The number of jobs supported annually by funding the water infrastructure gap is greater than the **employed workforce in sixteen states.**

Reverse osmosis membranes at the Carlsbad Desalination Plant, which supported thousands of local jobs and infused $350 million into the local economy during the three-year construction.

Atlanta Department of Watershed Protection estimates creating 5,775 jobs over the course of the $350 million water supply capital program.

A Day Without Water:

Service disruptions put **$43.5 billion** in daily economic activity at risk.

The costs of service disruption

Investment in water infrastructure is necessary to prevent disruptions in water service. Many places across the country—from large metropolitan centers to small town communities—have already begun to experience the consequences of major service disruptions due to aging infrastructure.

Because water is an essential input to industry, even temporary disruptions in service can have major impacts on business sales. Without water, production in many industries virtually grinds to a halt. Empirical investigations have measured the effects of temporary service disruptions on business sales in impacted communities (FEMA 2011, Aubuchon 2012). For every day of water service disruption, the average US business loses $230 in sales *per employee*. In industries most reliant on water, sales drop by up to 75 percent, or up to $5,800 per employee. At a national level, a one-day disruption in water service represents an aggregate daily loss of $43.5 billion in sales and $22.5 billion in GDP. **To put this level of economic activity in context, an eight-day national disruption in water service would amount to a 1 percent loss in annual GDP—putting roughly 1.9 million jobs at risk** (see Figure 8).

Industries that depend most on water infrastructure

Businesses receive reliable, clean, and relatively affordable water and wastewater services. This enables businesses to produce goods and services with water as an essential input. This study identifies commercial and industrial business categories that depend most on water and wastewater utilities, by comparing water use and business sales. These findings show that water-dependent businesses represent a broad range of sectors from universities, to hotels and restaurants, to pharmaceutical manufacturers (see Figure 9).

Put simply, water-dependent businesses are those that rely most on the services of water utilities to grow their business. For example, water utilities deliver an estimated 182 million gallons per day to hotels across the country for laundry, food service, and guest use. For every $1,000 in sales to the hotel industry, water utilities must deliver 4,700 gallons of water. For pharmaceutical manufacturers, water acts a critical raw input and solvent in the production process. For every manufacturing job added by the pharmaceutical industry, water utilities must deliver approximately 473,000 gallons of water. Given that water-dependent businesses such as these exchange goods and services with the larger economy, all sectors ultimately benefit from investments in water system efficiency and reliability.

Without reliable infrastructure to deliver water or remove wastewater, production in many industries would essentially grind to a halt.

At a national level, a one-day disruption in water service represents an aggregate daily loss of **$43.5 billion in sales and $22.5 billion in GDP**.

Figure 8

Economic Benefits of Water and Wastewater Service Reliability

	Savings Per Day of Avoided Service Disruption	
Impacts to Business	**Aggregate National ($BN)**	**Per Employee**
Sales Saved	$43.5 billion per day	$230 per day
GDP Saved	$22.5 billion per day	$120 per day
Days to 1% GDP Savings	8 days; 1.9 million jobs protected	

Values expressed in 2016 dollars. Source: IMPLAN 2015, FEMA 2011, Aubuchon 2012, Chang 2002.

Figure 9

Industries Most Dependent on Water Utilities

Industry	Gallons /$1000 sales	Gallons /Job
Junior colleges, colleges, universities, and professional schools	4,700	563,600
Other basic organic chemical manufacturing	1,100	2,116,500
Dry-cleaning and laundry services	700	48,300
Car washes	600	33,700
Wineries	400	141,600
Hotels and motels, including casino hotels	400	48,300
Paper mills	300	284,200
Breweries	300	328,000
All other food manufacturing	300	111,300
Plastics material and resin manufacturing	300	505,300
Full-service restaurants	300	14,100
Other aircraft parts and auxiliary equipment manufacturing	300	90,200
Metal coating and nonprecious engraving	300	71,100
Other concrete product manufacturing	300	59,900
Pharmaceutical preparation manufacturing	300	473,200

Source: IMPLAN 2015, USGS 2014.

Keeping water infrastructure in a good state of repair supports **$94 billion in annual productivity savings**.

The value of water service to business productivity

While water infrastructure provides broad economic benefits realized simply through the opportunities created by major capital investments, this does not account for the significant benefits to the customers of water systems and utilities—specifically, business productivity.

A centralized water delivery and treatment service allows businesses to connect to the system rather than building the infrastructure themselves. Without economies of scale, each business and household would have to independently source, clean, and treat their individual water use. These drinking water and wastewater services can be easily scaled as local household and business demand changes, rather than each individual attempting to scale their water and wastewater needs independently. The efficiency realized from a utility-scale drinking water and wastewater systems creates more productive local economies.

Productivity saved by closing the water infrastructure gap: $94 billion per year

If the water infrastructure gap is not addressed, industries and households are projected to experience higher costs to procure water and wastewater services. Costs may take the form of higher water rates, costs of self-supply, or costs of relocating to better-served areas. Meeting the funding gap would have a positive impact on the overall economy by avoiding these costs, allowing businesses to control their production costs and households to retain their spending power. Due to these effects on productivity and consumer demand, funding the water infrastructure gap would preserve $94 billion per year in business sales and 505,000 jobs over the next ten years (see Figure 10). The estimated productivity savings to businesses, and their associated economic impact, are based on the analysis prepared by ASCE in "Failure to Act: Closing the Infrastructure Investment Gap" (2016).

Additional economic benefits not quantified in this study

This study focuses on water infrastructure's contributions to the economy through construction spending and the provision of reliable water service to businesses. There are many other ways that water infrastructure benefits our society that have not been quantified in this analysis. By preventing contamination of natural water bodies, water infrastructure provides a valuable service to recreational industries that depend on our nation's waterways. The recreational boating and fishing industry alone is responsible for upwards of $70 billion in spending per year and employs over 150,000 people (EPA 2012). Water infrastructure has played an instrumental role in reducing the incidence of water-borne illness in the US. It has been estimated that the cost of a single disease outbreak associated with inadequately treated water exceeds $100 million in medical costs (Corso 2003).

If the water infrastructure gap is not addressed, costs to industries would total approximately **$28 billion per year**.

Figure 10

Annual Productivity Savings by Closing Water Infrastructure Gap

Business Sales Saved

	Annual Impacts*
2017–2026	**$94 billion/year**
2027–2040	**$402 billion/year**

Source: ASCE 2016. ASCE figures adjusted for inflation and to reflect 2017–2040 time period.

Jobs Saved

	Annual Impacts*
2017–2026	**505,000 jobs** (2026)
2027–2040	**956,000 jobs** (2040)

*Business sales reflect annual averages. Jobs reflect jobs preserved by 2026 and 2040 respectively.

Renewed investment in water infrastructure at the local, state, and federal level will foster a stronger economy, create jobs, and ensure economic competitiveness.

Renewed investment in water infrastructure from the local, state, and federal level fosters a stronger economy, creates jobs, and ensures American competitiveness—now, and for the future.

Conclusion

Water infrastructure is fundamental to our nation's economic health. By keeping water infrastructure in a state of good repair, we strengthen our economy. As this study shows, investments in water infrastructure generate high-quality jobs, increase the competitiveness of American businesses, and lead to a significant injection of economic activity throughout the nation. Over the long term, all sectors stand to benefit from improvements to the reliability and efficiency of water systems. By meeting the gap, the US economy stands to gain a total of $2,220 billion in additional economic activity over the next 10 years.

Investments in water systems during the prior century helped to drive economic growth, improve public health, and protect the nation's waterways. As infrastructure ages and capital needs escalate, we must uphold our commitment to the nation's water infrastructure. Meeting the investment need requires collaboration across public and private sectors, including strong partners at the local, state, and federal level. The funding gap is significant, but the benefits of filling the gap are far greater.

Sources

AECOM. 2014. National Economic and Labor Impacts of the Water Utility Sector. Water Research Foundation and Water Environment Research Foundation.

ASCE (American Society of Civil Engineers). 2016. Failure to Act: Closing the Infrastructure Investment Gap for America's Economic Future.

ASCE (American Society of Civil Engineers). 2013. 2013 Report Card for America's Infrastructure.

Aubuchon, C. and K. Morley. 2012. Lessons from Short-term Supply Disruptions: Providing Confidence and Context to FEMA's Methodology. EPA Contract Number EP-W-10-002.

AWWA (American Water Works Association). 2011. Buried No Longer: Confronting America's Water Infrastructure Challenge.

Bluefield Research. 2016. US Private Water Utilities: Market Trends, Strategies, and Opportunities.

BLS (Bureau of Labor Statistics). 2015. Quarterly Census of Employment and Wages. Table 1.9. Available at: <https://www.bls.gov/cew/> [accessed February 2, 2017].

BLS (Bureau of Labor Statistics). 2016. CPI Inflation Calculator. Available at: <https://data.bls.gov/cgi-bin/cpicalc.pl> [accessed February 2, 2017].

Brozovic, N., D.L. Sunding, and D. Zilberman. 2007. Estimating Business and Residential Water Supply Interruption Losses from Catastrophic Events, Water Resources Research.

Brun, L., et al. 2014. Infrastructure Investment Creates American Jobs. Center on Globalization, Governance & Competitiveness, Duke University.

CBO (Congressional Budget Office). 2015. Public Spending on Transportation and Water Infrastructure: 1956 to 2014.

CBO (Congressional Budget Office). 2013. Federal Investment.

Chang, S.E., W.D. Svekla, and M. Shinozuka. 2002. Linking infrastructure and urban economy: simulation of water-disruption impacts in earthquakes. Environment and Planning B: Planning and Design, 29, pp. 281-301.

Corso, P. et al. 2003. Cost of Illness in the 1993 Waterborne Cryptosporidium Outbreak, Milwaukee, Wisconsin. Emerging Infectious Diseases, 9(4), 427.

EPA (Environmental Protection Agency). 2016a. Clean Watershed Needs Survey 2012. Report to Congress.

EPA (Environmental Protection Agency). 2016b. Information About U.S. Public Water Systems. Available at: <https://www.epa.gov/dwreginfo/information-about-public-water-systems>.

EPA (Environmental Protection Agency). 2013. Drinking Water Infrastructure Needs Survey and Assessment: Fifth Report to Congress.

EPA (Environmental Protection Agency). 2012. The Importance of Water to the US Economy, Part I: Background Report. Office of Water, US Environmental Protection Agency. September 2012.

EPA (Environmental Protection Agency). 2009. 2006 Community Water System Survey. EPA-815-R-09-001.

FEMA (Federal Emergency Management Agency). 2011. Benefit-Cost Analysis Re-engineering (BCAR) Development of Standard Economic Values.

Galavotti, H. 2015. EPA's Stormwater Program and Improving Resiliency with Green Infrastructure. U.S. Environmental Protection Agency.

GAO (U.S. Government Accountability Office). 2016. Information Technology: Federal Agencies Need to Address Aging Legacy Systems.

Gebhardt, J. 2011. The Time to Invest in America's Water Infrastructure Is Now. EPA Blog.

Gordon, E., et al. 2011. Water Works: Rebuilding Infrastructure, Creating Jobs, Greening the Environment. Green For All.

Heintz, J., Polin, R., and H. Garrett-Peltier. 2009. How Infrastructure Investments Support the U.S. Economy: Employment, Productivity and Growth. Political Economy Research Institute. University of Massachusetts—Amherst.

Heintz, J., Polin, R., and H. Garrett-Peltier. 2011. The U.S. Employment Effects of Military and Domestic Spending Priorities. Political Economy Research Institute. University of Massachusetts—Amherst.

IMPLAN Group. 2015. IMPLAN System (data and software), 16740 Birkdale Commons Pkwy, Suite 206, Huntersville, NC 28078. <www.implan.com>.

OMB (Office of Management and Budget). 2003. Circular A-4, Regulatory Analysis.

PA Consulting Group. 2009. Sudden Impact: An Assessment of Short-Term Economic Impacts of Water and Wastewater Construction Projects in the U.S. Clean Water Council.

Shifrin, Neil. 2014. Environmental Perspectives: A Brief Overview. SpringerBriefs in Environmental Science.

U.S. Census Bureau. 2014. Census Regions and Divisions of the United States [Online]. Available at: <https://www.census.gov/geo/maps-data/maps/pdfs/reference/us_regdiv.pdf>. [cited February 2, 2017].

USGS (U.S. Geological Survey). 2014. Estimated Use of Water in the United States in 2010. Geological Survey Circular 1405.

WRF (Water Resources Foundation). 2016. Residential End Uses of Water—Version 2.

This report, along with the technical appendix, can be found at TheValueofWater.org/resources

Acknowledgements
The Value of Water Campaign would like to thank Alexander Quinn, Kevin Feeney, and Humberto Castro with Hatch Urban Solutions for conducting this analysis and preparing this report.

We are grateful to several Value of Water Campaign supporters who provided their expert review of the document, including: Richard Barnes, American Water; Paul Demit, MWH Global—now part of Stantec; Steve Dye, Water Environment Federation; Ted Henifin, Hampton Roads Sanitation District; Lori Irvine, CH2M; Greg Kail, American Water Works Association; Vincent Morris, DC Water; and Jean Smith, Northeast Ohio Regional Sewer Department.

A special thank you to US Water Alliance staff Danielle Mayorga for managing the development of this report, as well as to Emily Feenstra and Abigail Gardner for their contributions to this project.

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