

**America's Infrastructure: Today's Gaps, Tomorrow's
Opportunities, and the Need for Federal Investment**

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Introduction

Chairman Yarmuth, Ranking Member Womack, and members of the Budget Committee, thank you for inviting me today for this important discussion. My name is Carol Ellinger Haddock, P.E., and I am the Director of Houston Public Works. The Public Works department is responsible for the planning, operation, maintenance, construction management and design engineering of Houston's public infrastructure, including streets, storm drainage, water and wastewater, as well as permitting and inspection of development for more than 2.3 million Houstonians. In this role, I am also engaged in recovery from Hurricane Harvey as well as multiple significant floods in the previous two years, including a 500-year flood event just last week as Tropical Storm Imelda passed through Houston. Houston is committed to Build It Forward, in order to rebuild a more resilient community ready to withstand the next disaster but we need continued federal investments to move us further toward that goal.

I previously served as a legislative fellow on the U.S. Senate Committee on Environment and Public Works and as a project manager for the Harris County Flood Control District. I am a licensed Professional Engineer with a Bachelor of Science in Civil Engineering from Rice University and a Master of Arts in Public Administration from the University of Houston.

I am appearing today on behalf of the more than 150,000 members of the American Society of Civil Engineers (ASCE) for which I serve as a member of the Board of Direction. Founded in 1852, ASCE is the nation's oldest national engineering society representing the civil engineering professionals who serve as stewards of infrastructure here in the U.S. and around the globe.

ASCE appreciates the opportunity to discuss the impact our nation's crumbling infrastructure has on the economy and the benefits that can be gained by addressing these issues. We also thank the U.S. House Committee on the Budget for examining the economic impact of the current state of our infrastructure systems and the need for strong renewed federal involvement. ASCE is eager to work with Congress to find ways to further improve the state of our nation's infrastructure.

America's infrastructure includes highways, streets, public buildings, mass transportation facilities, resource recovery facilities, air transport facilities, water systems, waste facilities, dams, levees, ports and waterways, and other public and private facilities. Although taken for granted, the nation's infrastructure is vital to the nation's public health and welfare. It is also the foundation on which our national economy, global competitiveness, and quality of life depends.

Infrastructure connects the nation's businesses, communities, and people driving our economy and improving our quality of life. For the U.S. economy to thrive, we need a first class infrastructure system - transport systems that move people and goods sustainably, efficiently, and affordably by land, water, and air; energy transmission systems that deliver clean, reliable, low-cost power from a robust range of sources; and water systems that reliably and safely drive industrial processes as well as the daily functions of our communities. Yet today, our infrastructure systems are failing to keep pace with current and expanding needs, while investment in infrastructure falters. ASCE's *2017 Infrastructure Report Card* rated the overall condition of the nation's infrastructure a cumulative grade of "D+," with an investment gap of \$2 trillion.

If we are to achieve lasting progress for our infrastructure, the federal government must provide critical leadership and commit to not only financing infrastructure programs, but to funding them. Congress must do its part to enact long-term solutions, make regular appropriations, and maintain scheduled reauthorizations for the Water Resources Development Act, the Fixing America's Surface Transportation Act, and the myriad of other pieces of legislation that sustain our infrastructure. Further, all levels of government and the private sector must do its part to increase investment in order to restore America's world-class infrastructure.

Failure to Act: Closing the Infrastructure Investment Gap for America's Economic Future

In 2016, ASCE released *Failure to Act: Closing the Infrastructure Investment Gap for America's Economic Future*¹. This economic study analyzed the impact of current infrastructure investment trends on America's GDP, jobs, personal income, and businesses. The *Failure to Act* report found that over the next 10 years, surface transportation networks, which includes roads, bridges, transit, and commuter rail face an investment gap of \$1.1 trillion. Airports require an additional \$42 billion to close the funding gap, and inland waterways and ports need \$15 billion.

In total, ASCE's 2017 *Infrastructure Report Card* shows that the U.S. has only been paying about half of its infrastructure bill. Between 2016 and 2025, the investment gap totals just over \$2 trillion. Failing to close that gap risks rising costs, falling business productivity, plummeting GDP, lost jobs, and ultimately, reduced disposable income for every American family. Over the next 10 years, infrastructure will continue to degrade, resulting in a loss of 2.5 million jobs, \$3.9 trillion in GDP, and \$7 trillion in lost business sales by 2025. In addition, poor infrastructure will cost each American family \$3,400 a year, which is \$9 a day, in personal disposable income. That's money we're spending on unexpected car repairs and lost productivity as we sit in traffic and wait for the train.

Our infrastructure challenges are significant, but solvable. By spending an additional \$200 million each year for 10 years, we can close the investment gap. That additional funding should come from all levels of government –federal, state, and local – as well as the private sector.

Providing adequate investment for our infrastructure now will have profound economic benefits. Improved infrastructure will spur economic activity that will benefit America's public safety, health and welfare, as well as the GDP, jobs, personal income, and businesses.

ASCE's 2017 Infrastructure Report Card

Every four years, ASCE publishes the Infrastructure Report Card, which grades 16 major infrastructure categories using a simple "A" to "F" school report card format. It is through this format that ASCE educates the public on the current state of our nation's infrastructure system.

Bridges

The nation has 616,087 bridges, and in 2018 47,052, or 7.6%, of our nation's bridges were

¹ Failure to Act: Closing the Infrastructure Investment Gap for America's Economic Future. (2016)
www.asce.org/failuretoact

structurally deficient, meaning they require significant maintenance, rehabilitation, or replacement. In that same year, there were on average 178 million trips across a structurally deficient bridge each day. While the number of bridges in poor condition and considered structurally deficient is decreasing, ridership over America's bridges is increasing and puts our bridge users in potential risk. The most recent estimate puts the nation's backlog of bridge rehabilitation needs at approximately \$171 billion. ASCE's *2017 Infrastructure Report Card* gave our nation's bridges a "C+."

Roads

With over four million miles of roads across the U.S.— 15 lane interstates to residential streets—roads are among the most visible and familiar forms of infrastructure. In 2018, U.S. roads carried people and goods over 3.2 trillion miles. After a slight dip during the 2008 recession, Americans are driving more, and vehicles miles traveled is at an average growth rate of 1.1% annually over the 20 years through 2037.

Despite the high use and demand, the nation's roads are often crowded, frequently in poor condition, chronically underfunded, and are growing more dangerous. More than two out of every five miles of the nation's urban interstates are congested, and traffic delays cost the country \$170 billion in wasted time and fuel in 2017. One out of every five miles of highway pavement is in poor condition and our roads have a significant and increasing backlog of rehabilitation needs. After years of decline, driving on unsafe roads has led to 36,750 fatalities on our nation's roads in 2018. ASCE's *2017 Infrastructure Report Card* gave our nation's roads a "D."

Transit

Transit in America is growing and is adding new lines and systems every year. Yet, the symptoms of overdue maintenance and underinvestment have never been clearer. Despite increasing demand, the nation's transit systems have been chronically underfunded, resulting in aging infrastructure and a \$90 billion rehabilitation backlog. While some communities are experiencing a transit boom, many Americans still have inadequate access to public transit. ASCE's *2017 Infrastructure Report Card* gave our nation's transit system a "D-."

Drinking Water and Wastewater

Well-maintained public drinking water and wastewater infrastructure systems are critical for public health, and safety and economic success, as well as clean water and aquifers. Despite increased efficiency methods and sustainable practices, there is a growing gap between the capital needed to maintain drinking water and wastewater infrastructure and the actual investments made. By 2025, the investment gap for drinking water and wastewater infrastructure systems is estimated to be \$105 billion. According to the American Water Works Association, \$1 trillion will be needed to maintain and expand drinking water service demands during the next 25 years. ASCE's *2017 Infrastructure Report Card* gave the nation's drinking water infrastructure a grade of "D," and the nation's wastewater infrastructure did not fare much better with a grade of "D+."

Dams and Levees

Our nation's 91,468 dams and over 30,000 miles of levees are critical components of risk reduction and protecting communities, critical infrastructure, and trillions of dollars in property. However, an estimated \$80 billion is needed in the next 10 years to maintain and improve the nation's levees,

while the Association of State Dam Safety Officials estimates the cost of rehabilitating our nation's federal and non-federal dams to exceed \$70 billion, which includes the U.S. Army Corps of Engineers' (USACE) estimate that more than \$25 billion will be required to address dam deficiencies for Corps-owned dams. At the current rate of investment, these repairs would take over 50 years to complete. ASCE's *2017 Infrastructure Report Card* gave our nation's dams and levees each a grade of "D."

Inland Waterways

The USACE operates and maintains a vast network of 25,000 miles of inland waterways and 239 locks that support half a million jobs, deliver more than 600 million tons of cargo annually, and serve as the nation's connection to inland and ocean ports and international markets. Barge transport is the most fuel-efficient mode of the transportation of goods; however, with a majority of locks and dams reaching well beyond their 50-year design life—requiring frequent shutdowns for maintenance and repairs, nearly half of all vessels traveling through our inland waterways experience delays. ASCE's *2017 Infrastructure Report Card* gave our nation's inland waterways a grade of "D."

Public Parks

A vast network of infrastructure supports more than seven billion outdoor recreational outings. Americans enjoy park and recreation facilities maintained by entities at all levels of government. At the federal level, the National Park Service, U.S. Forest Service, and USACE are the main providers of park facilities. States and localities provide the bulk of park and recreational facilities that seven in 10 Americans use on a regular basis. National forests and grasslands capture and filter drinking water for 180 million people. America's parks and public lands also support industries such as lodging, restaurants and bars, grocery and convenience stores, and gas stations. Despite the popularity of our public parks, there has been chronic underinvestment. Currently, the National Park Service deferred maintenance is \$11.9 billion. ASCE's *2017 Infrastructure Report Card* gave our nation's parks a "D+."

The City of Houston

The City of Houston, like most cities across the United States, has made significant investments in the existing infrastructure. However, this comes after decades of underinvestment in maintenance and repairs on infrastructure that was not designed to accommodate Houston's level of growth. Houston is not alone in this challenge.

When asked about Houston's greatest challenges, Hurricane Harvey and the widespread flooding along the Texas coast comes to mind. Our location in the Gulf Coast Plain and our significant annual rainfall, even without tropical systems, makes flooding our primary natural disaster. We have been and remain of the communities with the highest losses paid through the National Flood Insurance Program. We do need significant investment in infrastructure to mitigate existing risks associated with extreme weather and minimize the threat of flooding.

Houston understands the need for local investment in infrastructure and has, over the past decade, made significant strides toward that end. Houstonians have voted for and then re-affirmed a dedicated revenue source for local drainage on streets – Build Houston Forward (formerly known

as ReBuild Houston). This dedicated revenue source includes:

- a drainage charge assessed at the parcel level,
- a portion of the local ad valorem (property tax) increment that historically has been dedicated to streets and drainage,
- creation of a stormwater impact fee, and
- the existing local sales tax increment for transit that is allocated back to cities for local transit infrastructure.

The combined funding from these sources supports more than \$50 million annually in operations and nearly \$200 million in capital projects that address both stormwater drainage and local transportation needs. Flood control in Houston has taken bold strides by regulating to the 500-year flood standard. This will help limit risks faced by new infrastructure, including homes.

The Harris County Flood Control District (HCFCD) serves as the primary local sponsor for the U.S. Army Corps of Engineer's projects that implement flood risk reduction in the Houston area. Separately funded through County property taxes, HCFCD provides the local match for significant USACE project only major waterways – Brays, Greens, Hunting, Sims and White Oak Bayous all have active federal projects with tangible flood risk reduction benefits.

However, we also need investment in our transportation network – roads, transit, freight and passenger rail, airports, and seaports.

The Houston Airport System serves nearly 60 million passengers each year, with more than 10 million travelers. There are nearly 200 non-stop destinations. The airports are continuously adapting and expanding to changes in aircraft security needs and passenger expectations. However, extreme weather events impact his critical infrastructure. During Tropical Storm Imelda, the airfield at the Bush Intercontinental Airport was operational, but flight operations were impacted when roadways into and out of the airport were impassable.

The Port of Houston remains one of the top three U.S. ports for foreign and domestic waterborne tonnage and foreign cargo value and serves more than two-thirds of the U.S. Gulf Coast container traffic. Maintaining the navigation depth requires a significant and on-going federal investment. Impacts to the Houston Ship Channel not only impact the Houston area and Texas region, but have a significant impact to the nation's refining capacity.

Houston is vitally served by the nation's Interstate Highway System. This system not only serves the commuting needs of nearly 7 million residents of the Greater Houston area, it serves as a primary freight trucking corridor out of Mexico, and for the freight entering the U.S. through the Port of Houston. Significant tonnage is moved from Houston in all directions using both truck and rail.

At the regional level, there is also an integrated toll road system serving the greater Houston area. These systems are operated by two separate toll road authorities. Significant funding has been set aside by the State of Texas to address both transportation and stormwater infrastructure. However, there are still more identified needs throughout the state than available funding.

Water and wastewater infrastructure systems, primarily supported by rates paid by users, are some of the most underfunded infrastructure nationwide. Even though the City of Houston has an annual budget of more than \$1 billion for operations and nearly \$400 million for capital investments, the backlog for decades of underinvestment is daunting. Correspondingly, rate increases can have significant impacts to a customer-base that has a large percentage of low-to-moderate income ratepayers.

The City of Houston is currently in the final phases of executing a Wastewater Consent Decree with the Environmental Protection Agency and the Texas Commission on Environmental Quality focused on an aging wastewater system. The efforts are estimated at approximately \$2 billion above what had been planned for in the next fifteen years.

The City is also actively constructing a 320 MGD drinking water treatment plant expansion that will serve the City of Houston and four regional water authorities. This \$1.8 billion expansion will be brought on-line in increments in 2022 and 2025. Additionally, the City's existing plants, some of which date back to the mid-1950's, will require significant reinvestment in the coming decades.

The City of Houston relies heavily on the availability of the State Revolving Funds to implement these water and wastewater projects. Continued federal investment in these programs is critical to local water and wastewater infrastructure projects.

The infrastructure investment needs in the Houston region are similar in scope and impact to most cities throughout the country. Funding is required at all levels or the investment gap will continue to grow with the corresponding negative impact on the economy and the public health, safety, and welfare.

Solutions to Address our Infrastructure Needs

Failing to close this economic infrastructure investment gap brings serious national consequences.

Our nation is at a crossroads. Deteriorating infrastructure impedes our ability to compete in the thriving global economy, and improvements are necessary to ensure our country is built for the future. While we have made some progress, reversing the trajectory after decades of underinvestment requires transformative action from Congress, states, infrastructure owners, and the American people. However, there are solutions to fixing our national infrastructure deficit.

If the U.S. is serious about achieving an economy fit for the 21st century, we must take specific steps, starting with increased, long-term, consistent infrastructure investment. Delaying such investment only escalates the costs and risks of our economy. To close the \$2 trillion 10-year investment gap and compete against growing economies, we must increase investment from all levels of government and the private sector from 2.5 percent to 3.5 percent of GDP by 2025.

ASCE believes that there are solutions to our infrastructure crisis. These solutions do require further investment by government at all levels and by the private sector. However, money alone will not solve our programs. We must use our resources wisely. Specifically:

- We must make investments that provide substantial, long-term benefits to the public and the economy.
- We must ensure that the cost of a project over its entire life span – including designing, building, operating, and maintaining the infrastructure – is taken into account.
 - ASCE supports the appropriate use of Life-Cycle Cost Analysis (LCCA) principles in the planning and design processes to evaluate the total cost of projects. ASCE believes that Congress should require all projects greater than \$5 million that receive federal funding use LCCA and develop a plan for funding the project, including its maintenance and operation, until the end of its service life. The analysis should include life-cycle cost associated with planning, funding, design, construction, operation, maintenance, and decommissioning of projects. The analysis should also include impacts associated with innovation, resiliency and sustainability as well as regulatory, environmental, safety, and other costs reasonably anticipated during the life of the project, whether borne by the project owner or other stakeholders. Overall life-cycle costs are one of the more most significant considerations in evaluating project alternatives during the planning and design of infrastructure.
 - ASCE has embarked on an initiative to ask civil engineers from all backgrounds and at every career stage to implement performance-based standards, resilience, innovation and LCCA in all projects.
- We must build projects that are sustainable and resilient. Resilience is critically important to the overall health of our nation’s infrastructure network. This goal can be achieved by:
 - Developing active community resilience programs for severe weather and seismic events to establish communications systems and recovery plans to reduce impacts on the local economy, quality of life, and environment;
 - Considering emerging technologies and shifting social and economic trends – such as autonomous vehicles, distributed power generation and storage, and larger ships – when building new infrastructure, to assure long term utility;
 - Improving land use planning at the local level to consider the function of existing and new infrastructure, the balance between the built and natural environments, and population trends in communities of all sizes, now and into the future; and
 - Supporting research and development into innovative new materials, technologies, and processes to modernize and extend the life of infrastructure, expedite repairs or replacement, and promote cost savings
 - Building infrastructure that is designed to meet future needs and withstand future hazards often comes with a higher initial price. However, it is a worthwhile investment that pays for itself down the road. In January 2019, the National Institute of Building Sciences (NIBS) issued the Natural Hazard Mitigation Saves: 2018 Interim Report. The 2018 Interim Report highlights the significant savings that result from implementing mitigation strategies found in up-to-date building codes, in terms of safety, and the prevention of property loss and disruption of day-to-day life. The Institute's project team looked at the results of 23 years of federally funded mitigation grants provided by the Federal Emergency Management Agency (FEMA), U.S. Economic Development Administration (EDA) and U.S. Department of Housing and Urban Development

- (HUD) and found mitigation funding can save the nation \$6 in future disaster costs, for every \$1 spent on hazard mitigation.
- By becoming a more resilient nation, we can ensure our infrastructure is built for the future and our nation's limited federal resources are spent wisely, with mitigation and preparedness in mind. Therefore, we urge Congress to support and include resiliency goals in all infrastructure related legislation to ensure we are preparing for the future and limiting our long-term costs. Houston, and each of the cities making significant investments during recover from natural disasters, urge Congress to make these investments in a way to minimize future economic, environmental, and social risk.
 - We must ensure that Federal investment leverages state, local, and private investment. In recent years, state legislatures have worked diligently to increase funding on infrastructure projects. At least 13 states have enacted legislation regarding the use of "life-cycle cost analysis," which generally includes design strategies, activity timing, and agency, user and life-cycle costs. 31 of the 50 states have raised or reformed their motor fuel taxes during the past decade which includes indexing their gas taxes to inflation or other economic benchmarks, enabling regular increases to preserve the tax's real value. With transportation hurdles cleared, legislatures then turn their attention to topics like drinking water, dam safety, and flood mitigation. Going beyond the legislature, the public has recognized the need to invest in infrastructure by supporting infrastructure measures at the ballot boxes. These initiatives, referendum, and propositions cover a broad range of civil engineering interests from costal restoration to preserving gas tax revenue in "lockboxes" to approving general issues bonds for wastewater and drinking water infrastructure. In 2018, The Eno Center for Transportation estimated the 250 transportation ballot measures spread across 25 states alone totaled over \$55 billion in potential investment.
 - We must put the "trust" back into "trust funds." Dedicated public funding sources on the local, state, and federal levels need to be consistently and sufficiently funded from user-generated fees, with infrastructure trust funds never used to pay for or offset other parts of a budget.
 - We must Fix the Highway Trust Fund by raising the federal motor fuel tax. To ensure long-term, sustainable funding for the federal surface transportation program the current user fee – 18.4 cents per gallon on gasoline and 24.4 cents per gallon on diesel fuel – must be raised by at least 25 cents per gallon and tied to inflation to restore its purchasing power, fill the funding deficit, and ensure reliable funding for the future.
 - Our nation's water resources systems are crucial to our nation's economy, public safety, and the preservation and enhancement of our environmental resources. Our levees, dams, inland waterways, and ports protect hundreds of communities, support millions of American jobs, and generate trillions of dollars of economic activity. However, many of these infrastructure assets have reached the end of their design life, and the investment gap must be closed if we hope to both repair and modernize our water resources systems to be competitive in the 21st century; that is why ASCE supports biennial reauthorization of the Water Resources Development Act (WRDA).

- We must authorize programs to improve specific categories of deficient infrastructure and support that commitment by fully funding them in an expedient, prioritized manner.
- We must ensure that infrastructure owners and operators charge, and Americans must be willing to pay, rates and fees that reflect the true cost of using, maintaining, and improving all infrastructure, including our water, waste, transportation, and energy services.
- We must consider emerging technologies and shifting social and economic trends – such as autonomous vehicles, distributed power generation and storage, and larger ships – when building new infrastructure, to assure long-term utility.
- We must improve land use planning at the local level to consider the function of existing and new infrastructure, the balance between the built and natural environments, and population trends in communities of all sizes, now and into the future.
- We must support research and development into innovative new materials, technologies, and processes to modernize and extend the life of infrastructure, expedite repairs or replacement, and promote cost savings.

Conclusion: A 21st Century Vision for America's Infrastructure

ASCE thanks the Committee for holding this hearing on a topic that affects the quality of life and livelihood of every American.

During the 20th Century, the federal government led the way in building our nation's greatest infrastructure systems. From the Works Progress Administration projects completed during the Great Depression to the creation of the Interstate Highway System in the 1950s and 1960s, the 20th Century is remembered as a time when Americans took pride in building a strong and lasting infrastructure foundation.

In the 21st century, ASCE would like to see a renewed commitment building on and enhancing that legacy. An America that thrives because of high quality infrastructure. Infrastructure is the foundation that connects the nation's businesses, communities, and people – driving our economy and improving our quality of life. For the U.S. economy to be the most competitive, we must have a first-class infrastructure system.

We must commit today to make our vision of the future a reality – an American infrastructure system that is the source of our prosperity. ASCE and its 150,000 members look forward to working with the House Committee on the Budget to improve America's infrastructure so that every family, community, and business can thrive.