

**Building Resilient Communities**

**Hearing**

**Wednesday, March 13, 2019**

**Committee on Appropriations**

**Subcommittee on Transportation, Housing and Urban  
Development, and Related Agencies**

**U.S. House of Representatives**

**Ms. Carol Haddock P.E., F.ASCE**

**Director of Houston Public Works**

**City of Houston**

**Houston, TX**

**\*On behalf of the American Society of Civil Engineers**

## **Introduction**

Chairman Price, Ranking Member Diaz-Balart, and members of the Appropriations Subcommittee on Transportation, Housing and Urban Development, and Related Agencies (THUD), 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. 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.

Previously, I had also 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 currently a member of the Board of Direction of the American Society of Civil Engineers (ASCE). Founded in 1852, ASCE is the nation's oldest national engineering society and represents 150,000 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 state of our nation's infrastructure, the

need for action, and how to ensure a more resilient infrastructure when rebuilding these important assets. We also want to thank the U.S. House Committee on Appropriations Subcommittee on THUD for your efforts to examine the current state of our infrastructure systems, and the need for strong federal involvement. ASCE is eager to work with the Committee in 2019 to find ways to modernize our nation's infrastructure and enable more resilient communities.

Civil engineers are working to rebuild and upgrade infrastructure to better withstand new challenges with a changing climate, operating under the assumption that hazard events will continue with increasing regularity and severity. Houston and Harris County have recently adopted floodplain development regulations that are some of the strictest in the country setting protection levels requiring protection for structures to be measured to 2-feet above the 500-year floodplain. This was done in anticipation of new rainfall statistics under development by NOAA. In addition to anticipating what hazards and conditions roads, bridges, drinking water pipes, wastewater treatment plants, airports, and powerlines must withstand, engineers are also thinking through how technology, population shifts, and other trends will change communities' needs.

Our nation faces significant deferred maintenance backlogs today that leave our infrastructure systems vulnerable to failure. ASCE's *Infrastructure Report Card*<sup>1</sup> rated the overall condition of the nation's infrastructure a cumulative grade of "D+," with an investment gap of \$2 trillion.

Historically, our nation invested in infrastructure projects with long-term benefits, such as the Hoover Dam and Interstate Highway System, that strengthened the economy and were designed and built for generations to come. ASCE seeks to raise awareness of the United States' pressing infrastructure challenges, and some incremental progress has been made since ASCE

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<sup>1</sup> <https://www.infrastructurereportcard.org/>

released its first *Infrastructure Report Card* in 1998.

These past successes inform us that the next major investment in American infrastructure will require bold vision coupled with thoughtful planning. If we are to achieve lasting progress for our infrastructure, the federal government must commit to not only financing infrastructure programs, but to funding them. This funding must supplement – rather than replace – long-term solutions, regular appropriations, and scheduled reauthorizations. Further, all levels of government and the private sector must do their part to increase this investment in order to restore America’s world-class infrastructure.

### **Failure to Act: Closing the Infrastructure Investment Gap for America’s Economic Future**

Infrastructure is the foundation that connects the nation’s businesses, communities, and people, serves as the backbone to the U.S. economy, and is vital to the nation’s public health and welfare. Houston is a young city compared to many in the nation, but much of the city’s infrastructure is nearing or has reached the end of its useful life or has become functionally obsolete. We have very significant choices to make both in how much and how we will reinvest as we recover from multiple floods, including Hurricane Harvey in order to ensure that we have a resilient future.

In 2016, ASCE released *Failure to Act: Closing the Infrastructure Investment Gap for America’s Economic Future*<sup>2</sup>. This economic study analyzed the impact of current infrastructure investment trends on America’s GDP, jobs, personal income, and businesses. The study determined that the U.S. is on track to invest only half of what is needed in infrastructure over the

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<sup>2</sup> Failure to Act: Closing the Infrastructure Investment Gap for America's Economic Future. (2016)  
[www.asce.org/failuretoact](http://www.asce.org/failuretoact)

next decade. This underinvestment will cause our infrastructure to further 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. To catch up and fill in the investment gap, we must invest an additional \$144 billion each year, which is an average investment of just \$3 per day per household. This small investment would put \$3,400 back into the wallets of American families each year for a three to one return.

*Failure to Act* found that our infrastructure challenges are significant, but solvable. Surface transportation categories, including roads, bridges, transit, and commuter rail, face the largest investment gap. We must invest an additional \$1 trillion throughout this network. Airports require an additional \$42 billion to close the funding gap, and inland waterways and ports need \$15 billion. It is time to invest in our nation's infrastructure because the longer we wait, the more it will cost.

### ***Fundamental Criteria for Future Infrastructure Investment***

ASCE believes that all infrastructure programs and projects supported by infrastructure investment legislation must meet the following fundamental criteria:

- Investments must provide substantial, long-term benefits to the public and the economy;
- The cost of a project over its entire life span – including designing, building, operating, and maintaining the infrastructure – must be taken into account;
- Projects should be built sustainably and resiliently; and
- Federal investment should leverage state, local, and private investment, not replace these other critical sources of infrastructure funding.

ASCE urges the Subcommittee and full House Committee on Appropriations to focus first

on prioritizing those aspects of our infrastructure most in need of repair, replacement, and modernization, to sustain our economy, public health, and safety.

## **Resilience**

Resilience is critically important to the overall health of our nation's infrastructure network. Resilience is also one of the eight key criteria used for assessment in our Infrastructure Report Card. ASCE's *2017 Infrastructure Report Card* emphasizes the importance of preparing for the future by utilizing new approaches, materials, and technologies to ensure our infrastructure is more resilient and sustainable. 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.

### **Federal Flood Risk Management Standard**

ASCE supported the Federal Flood Risk Management Standard (FFRMS), which considered and mitigated flood disaster risks for federally funded development in flood prone areas. Considering that the nation has experienced \$750 billion in losses from flood-related damages between 2000 to 2017, and with more than half of the nation's population living within 50 miles of a coast, the risk-management approach taken by the FFRMS is critical. Unfortunately,

President Trump rescinded the FFRMS in an August 2017 Executive Order.

ASCE supports the federal mitigation of risk, especially pre-disaster mitigation. Houston is currently in a post-disaster recovery mode for Hurricane Harvey, but we are simultaneously in a pre-disaster mitigation mode for the next storm. Incorporating appropriate investments as part of the recovery that will reduce the risk of future recovery through pre-disaster mitigation is difficult under the current funding streams.

ASCE believes that the FFRMS takes a fiscally responsible, common sense approach of mitigating flood disaster risks and should be a part of any sustainable agency and organizational planning. Implementation of this kind of standard is good resource management. We urge Congress to develop a federal flood risk standard to safeguard our nation's infrastructure, protect businesses and communities, and conserve taxpayer resources.

### **Life Cycle Cost Analysis**

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. The goal is to significantly enhance the performance and value of infrastructure projects over their life cycles and to foster the optimization of infrastructure investments for society. A renewed focus on life-cycle cost analysis allows engineers and planners to assess not just the upfront cost of a project, but also the operation and maintenance costs, and the cost of retiring an asset. In many cases, evaluating the total cost of ownership of a project leads to different design decisions among competing alternatives, enabling greater resilience. Houston is already working to incorporate LCCA into current infrastructure projects, particularly in water and wastewater infrastructure.

### **Codes and Standards**

ASCE supports the development, adoption, and enforcement of a national model building code as a key method of creating disaster resilience in communities to protect and improve public health, safety, and economic vitality. Standards such as ASCE 7, *Minimum Design Loads and Associated Criteria for Buildings and Other Structures (ASCE/SEI 7-16)*, which is an integral part of building codes in the U.S., describes the means for determining soil, flood, tsunami, snow, rain, atmospheric ice, earthquake, and wind loads, and their combinations for resilient structural design. Additionally, ASCE 24, *Flood Resistant Design and Construction*, prescribes a standard for cost-effectively increase resiliency by reducing and eliminating risks to property from flood hazards and their effects. ASCE 41, *Seismic Evaluation and Retrofit of Existing Buildings*, standardizes methods for the retrofit of existing buildings to increase resiliency in communities after a seismic

event.

Appropriators should provide robust funding to those federal agencies whose missions includes the following activities:

- Supporting the adoption of a national model building code;
- Promoting national incentive programs encouraging state and local agencies to adopt building codes;
- Improving implementation of current building codes and increase resources for enforcement;
- Advancing and participate in the creation or improvement of model building codes; and
- Funding for research that is necessary for the development of model building codes.

Responsible design and construction are essential to improve the quality of life, assure safety and durability, and reduce vulnerability of the nation's infrastructure. The purpose of a building code and the consensus-based standards on which they are based is to establish minimum requirements necessary to protect and improve public health, safety and welfare in the built environment. Model building codes provide for protection from fire, structural collapse, general deterioration, and extreme loads related to man-made and natural hazards. They are also created to conserve natural resources, reduce owner costs, and preserve the environment by establishing minimum building standards. Safe and sustainable buildings are achieved through performance-based, code-based design, and construction practices in concert with a code administration program that ensures compliance.

### **Research and Development**

Increased funding for infrastructure improvements are necessary, but must also be matched

with a robust research and development program (R&D) that can lead to new approaches, materials, and technologies to ensure our infrastructure is more resilient – to more quickly recover from significant weather and other hazard events, and sustainable – improving the “triple bottom line” with clear economic, social, and environmental benefits.

ASCE supports basic and applied R&D programs, coupled with demonstration and commercialization programs, structured to meet needs for:

- Revitalizing the nation's public works infrastructure to protect citizens by improving function and reducing life-cycle costs;
- Enhancing environmental quality and fostering sustainable development;
- Increasing the application of identifying, proving, and fielding emerging technologies, materials and processes to improve security, durability, disaster resilience, sustainability, and performance of engineered systems;
- Advancing the business performance of the practice of civil engineering and the industries supported by civil engineering services through Quality Based Selection (QBS) to improve the nation's competitiveness; and
- Enhancing the security, safety and resilience of critical infrastructure to protect the safety and economic vitality of the nation against natural and man-made hazards.

As an example of demonstration and commercialization, the City of Houston has formed a partnership with the Texas based non-profit Accelerate H2O. This non-profit is the nation’s First Water Technology Hub for Municipal Water Innovation and Emergency Response<sup>3</sup> to accelerate the demonstration and commercialization of infrastructure from existing research to market

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<sup>3</sup> <https://www.accelerateh2o.org/demonstration-hubs>

through full-scale, in-the-field locations to evaluate emerging technology on scientific, technical, engineering and economic value proposition.

**Conclusion: A 21<sup>st</sup> 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. Over the next 100 years, we see 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. The backlog of infrastructure maintenance presents an opportunity to go beyond the status quo, optimize our infrastructure investments, and design our infrastructure to be resilient by building for today and being ready for tomorrow.

We must commit 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 U.S. House Committee on Appropriations THUD Subcommittee to improve America’s infrastructure so that every family, community, and business can thrive.