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Statement for the Record of

The American Society of Civil Engineers

on

"Building Smarter: The Benefits of Investing in Resilience and Mitigation"

Subcommittee on Economic Development, Public Buildings, and Emergency Management
Committee on Transportation and Infrastructure
U.S. House of Representatives

March 18, 2021

Introduction

The American Society of Civil Engineers (ASCE)[1] appreciates the opportunity to submit a statement to the Transportation and Infrastructure Committee's Subcommittee on Economic Development, Public Buildings, and Emergency Management for the hearing on *Building Smarter: The Benefits of Investing in Resilience and Mitigation*.

Civil engineers are responsible for the planning, design, construction, operations, and maintenance of physical infrastructure, including communication facilities, energy generation and distribution facilities, industrial buildings, transportation networks, water supply and sanitation systems, and flood control structures. Most infrastructure is built to provide long service lives (50 to 100 years) and are expected to remain functional, durable, and safe. However, the increasing frequency and intensity of natural disasters, combined with increasing population densities, and system interdependencies have demonstrated vulnerabilities in the nation's infrastructure.

To ensure the nation's infrastructure systems continue to provide critical services and acceptably low risks of failures over time, engineers, designers, planners, and policymakers must incorporate system resilience into the decision-making process. Our nation's infrastructure system is only as strong as its weakest link — if our roadways become too rough or flooded to travel, if our bridges close to heavier traffic like ambulances, if a region's energy grid is devastated by high winds, or if our levees protect one community at the expense of the one next door, the economy grinds to a halt. Therefore, the foundational step in building smarter and improving resilience is first assessing the nation's existing infrastructure needs and conditions.

ASCE's *2021 Report Card for America's Infrastructure*

Every four years, ASCE publishes the *Infrastructure Report Card*, which grades nation's major infrastructure categories using a simple A to F school report card format. The Report Card examines the current infrastructure needs and conditions by assigning grades and making recommendations to raise them. The 2021 *Report Card for America's Infrastructure*[2] was released on March 3rd and graded 17 categories with the cumulative grade of "C-." This grade represents the first time in 20 years that our infrastructure is out of the "D" range. The 2021

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[1] ASCE was founded in 1852 and is the country's oldest national civil engineering organization. It represents more than 150,000 civil engineers individually in private practice, government, industry, and academia who are dedicated to the advancement of the science and profession of civil engineering. ASCE is a non-profit educational and professional society organized under Part 1.501(c) (3) of the Internal Revenue Code. www.asce.org,

[2] https://infrastructurereportcard.org/

Report Card therefore demonstrates that we have made some incremental progress toward restoring our nation's infrastructure, however much work is left to be done.

Overall, the 2021 grades range from a "B" for rail to a "D-" for transit. Five category grades — aviation, drinking water, energy, inland waterways, and ports — went up, while just one category — bridges — went down. And stormwater infrastructure received its first grade: a disappointing D. Overall, eleven category grades were stuck in the D range, a clear signal that our overdue bill on infrastructure is a long way from being paid off.

The Report Card also clearly illustrates that we are still just paying about half of our infrastructure bill, as the total investment gap has gone from $2.1 trillion over 10 years to nearly $2.59 trillion over 10 years. As ASCE discovered in its 2021 study, *Failure to Act: Economic Impacts of Status Quo Investment Across Infrastructure Systems*[1], failing to close this infrastructure investment gap brings serious economic consequences. Poor roads and airports mean travel times increase. An aging electric grid and inadequate water distribution make utilities unreliable. Problems like these translate into higher costs for businesses to manufacture and distribute goods and provide services. These higher costs, in turn, get passed along to workers and families. By 2039, America's overdue infrastructure bill will cost the average American household $3,300 a year, or $63 a week. When we fail to invest in our infrastructure, we pay the price.

Solutions

ASCE's Report Card does not just define the challenges we face, but makes recommendations to address our infrastructure problems, improve our quality of life, and strengthen our international competitiveness. The solutions include bold **leadership and action**, sustained **investment**, and a **focus on resilience** to raise the national infrastructure grade over the next four years, so that every American family, community, and business can thrive.

Strong leadership and decisive action require a clear understanding of what the United States needs to achieve an infrastructure system fit for the future. To close the nearly $2.59 trillion 10-year investment gap identified in the 2021 Report Card, meet future needs, and restore our global competitive advantage, we must increase investment from all levels of government and the private sector from 2.5% to 3.5% of U.S. Gross Domestic Product (GDP) by 2025.

As we consider these long-term investments, it must be through the lens of ensuring that our nation's infrastructure is resilient **-**using new approaches,

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[1] https://infrastructurereportcard.org/resources/failure-to-act-economic-reports/

materials, and technologies to ensure infrastructure systems can withstand or quickly recover from natural or man-made hazards.
Advancements in resilience across all infrastructure sectors can be made by:

- Enabling communities to develop and institute their own resilience pathway for all their infrastructure portfolios by streamlining asset management, implementing **life cycle cost analysis** into routine planning processes, and **integrating climate change projections** into long-term goal-setting and capital improvement plans.
- Incentivizing and enforcing the use of **codes and standards**, which can mitigate risks of major climate or manmade events.
- Understanding that our infrastructure is a system of systems and encourage a dynamic, “big picture” perspective that weighs tradeoffs across infrastructure sectors while keeping resilience as the chief goal.
- Prioritizing projects that improve the safety and security of systems and communities, to ensure continued reliability and enhanced resilience.
- Improving land use planning across all levels of decision-making to strike a balance between the built and natural environments, while meeting community needs, now and into the future.
- Enhancing the resilience of various infrastructure sectors by including or enhancing natural or “green” infrastructure.

Adaptation to Climate Change

To address the challenges faced by climate change will take leadership and a commitment to act proactively instead of reactively. Specially, we must:

- Establish government policies that encourage anticipation of and preparation for impacts of climate change on the built environment.
- Make necessary revisions to engineering design standards, codes, regulations, and associated laws that strengthen the sustainability and resiliency of infrastructure at high risk of being affected by climate change.
- Conduct the necessary research, development, and demonstration to advance recommended civil engineering practices and standards to effectively address climate change impacts.
- Encourage cooperative research among engineers and climate, weather, and life scientists to gain a better understanding of the magnitudes and consequences of future extremes.
- Prioritize the informing of practicing engineers, project stakeholders, policy makers, and decision makers about the uncertainty in predicting future climate and the reasons for the uncertainty.
- Develop a new paradigm for engineering practice in a world in which climate is changing but the extent and time of local impacts cannot be projected with a high degree of certainty.
- Identify critical infrastructure that is most threatened by changing climate and informing decision makers and the public.

ASCE urges Congress to continue its recent path to address the impacts of climate change. Immediate action can be taken by passing both the PRECIP Act (H.R. 1437) and the FLOODS Act (H.R. 1438). These bills aim to address the out of date, but critical data that engineers, flood plain managers, dam safety officials, and local government require when designing structures, implementing evacuation orders, as well as making long-term decisions like planning zoning restrictions to minimize climate risks. ASCE supports both bills and urges Congress to pass them as part of any climate mitigation package.

Building Codes and Standards

The most reliable way to ensure our nation's infrastructure is resilient is the widespread adoption and enforcement of modern, up to date building codes. Model building codes are developed by experienced volunteer professionals working together under a multi-step, consensus-based process. Most professional engineering organizations maintain code development committees that initiate code provisions based on the practice in their technical areas and are often augmented by research. Topics for code provisions are often introduced in case study reports or research papers. In time, many of these provisions are gathered and published as design guidelines. Eventually the guidelines are transformed into standards and incorporated into the model code.

ASCE engages in the standards setting on a large scale. ASCE Standards provide technical guidelines for promoting safety, reliability, productivity, and efficiency in civil engineering. Many of our standards are referenced by model building codes and adopted by state and local jurisdiction. They also provide guidance for design projects around the world. Accredited by the American National Standards Institute (ANSI), ASCE has a rigorous and formal process overseen by the Codes and Standards Committee (CSC). Standards are created or updated by a balanced, volunteer standards committee, followed by a public review period.

ASCE supports the development, adoption, and enforcement of a national model code as a key method of minimizing climate impact and creating disaster resilience in communities to protect and improve public health, safety, and economic vitality. The following ASCE documents offer a sound basis upon which such a model code can be developed:

- ASCE 7, Minimum Design Loads and Associated Criteria for Buildings and Other Structures (ASCE/SEI 7-16)[1], currently an integral part of U.S. building codes, describes the means for determining soil, flood, tsunami, snow, rain, atmospheric ice, earthquake, and wind loads, and their combinations for resilient structural design;

[1] https://www.asce.org/asce-7/

- ASCE 24, Flood Resistant Design and Construction[1], prescribes a standard for cost effectively increasing 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; and

- ASCE Manual of Practice 140, Climate-Resilient Infrastructure: Adaptive Design and Risk Management, provides guidance for and contributes to infrastructure analysis/design in a world in which risk profiles are changing due to climate change per the Fourth National Climate Assessment.

ASCE has furthered its standard development efforts by creating the ASCE-7 Hazard Tool[2]. The tool provides quick, reliable way to look up hazard data for seven environmental hazards including wind, seismic, ice, rain, snow, flood, and tsunami, to determine multiple types of hazard loads for buildings and other structures.

In the wake of Hurricane Harvey, the City of Houston voted to require all new construction in the city's floodplains be built two feet above the 500-year floodplain. Florida, meanwhile, has made a series of updates to their building codes over the past twenty years, including the mandated use of stronger nails, relocation of vents, and more thorough inspection processes. These are strong examples of how codes can be modernized and ASCE standards can be incorporated to strengthen a city or state's resilience.

Therefore, while many state and local government are leading the way, ASCE encourages Congress to continue to support and incentivize the widespread adoption and enforcement of up-to-date building and infrastructure codes. Additionally, we urge Congress to provide robust funding to those federal agencies whose mission includes preparing and implementing a national model code addressing climate change, as well as promoting national incentive programs encouraging state and local agencies to adopt a national model code.

Building on Progress

ASCE applauds Congress for the enactment of the Disaster Recovery Reform Act of 2018 (DRRA) in 2018. DRRA authorized the National Public Infrastructure Pre-Disaster Mitigation fund, which is being funded as a 6 percent set-aside from disaster expenses and allows for a greater investment in mitigation before a disaster. The Federal Emergency Management Agency (FEMA) responded to the law by creating the Building Resilient Infrastructure and Communities (BRIC)

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[1] https://ascelibrary.org/doi/book/10.1061/asce24
[2] https://asce7hazardtool.online/

Program. ASCE[1] has praised FEMA for its efforts to implement the transformational provisions of DRRA and for engaging the stakeholder community, including ASCE, in the implementation of BRIC. We are encouraged to see that FEMA has been responsive to its stakeholders by incorporating feedback in the key provisions within the BRIC.

ASCE also applauds Congress for the creation of the Resilience Revolving Loan Fund. ASCE has noted that the Resilience Revolving Loan Fund will help communities take proactive measures in the wake of the record-breaking flooding our country has experienced, and it would facilitate innovative solutions that allow cities to reduce federal disaster spending in the future. Prioritizing resilient infrastructure, including energy and water systems, is critical to a thriving economy and healthy communities, and ASCE is proud to support this legislation.

It is actions like these that have shown Congress's commitment to resilience and ASCE urges Congress to continue these efforts going forward. Our future depends on resilient infrastructure, and as civil engineers, we are thinking about building infrastructure that will last for one hundred years, or more. To ensure our infrastructure is more resilient and sustainable, we must plan with new technologies, approaches, materials, and policies that focus on long-term dividends rather than upfront costs.

Sustainability

ASCE has long considered sustainability a strategic issue confronting practicing civil engineers. Its integration into professional practice is required to address changing environmental, social, and economic conditions ethically and responsibly. Although challenging issues such as climate change, urbanization, and the rapid pace of technological advancement create opportunities, they also require serious re-evaluation of current professional practice and standards. To address this state of affairs, ASCE has outlined a roadmap[2] to transform the profession.

To achieve sustainable infrastructure, engineers must approach projects and engineering in a new way. The focus of our engineering efforts must shift from the product of our work—the stormwater management system, the bridge, the building—to the needs and benefits that the project aims to address. We must consider all possible alternatives before projects and programs are conceived, executed, and operated—in other words, to "do the right project."

Additionally, ASCE is developing a standard to provide further guidance for sustainable practice. This new standard, to be called ASCE/COS 73-XX

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[1] https://www.infrastructurereportcard.org/wp-content/uploads/2020/05/ASCE-Statement-to-FEMA-on-BRIC-Guidance-5-11-20-FINAL.pdf

[2] https://www.asce.org/sustainability-roadmap/

Standard Requirements for Sustainable Infrastructure[1], is intended to guide sustainable infrastructure development through the entire life-cycle process. The standard will encourage transformative development of the infrastructure solutions at the earliest stages; consider and analyze all reasonable alternatives; and consider natural, no-construction and constructed project solutions. For constructed project solutions, the entire life cycle of the project shall be considered within the context of this standard. The standard is being developed through the American National Standards Institute (ANSI) which permits comments from all stakeholders.

Life-Cycle Cost Analysis

The ASCE Grand Challenge encourages engineers to implement performance-based standards, resilience, innovation, and life cycle cost analysis (LCCA) in all projects. LCCA is assessing the total cost of facility ownership and considers all costs of acquiring, owning, and disposing of a building or building system. The goal is to significantly enhance the performance and value of infrastructure projects over their life cycles and to foster the optimization of investments. The use of LCCA will raise the awareness of owners, clients, and the public to a more accurate cost of infrastructure. The systematic use of LCCA will promote innovative, resilient, sustainable, and cost-effective engineering solutions.

ASCE recommends the appropriate use LCCA principles in the planning and design processes to evaluate the total cost of projects. 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.

Conclusion

ASCE once again thanks the Subcommittee on Economic Development, Public Buildings, and Emergency Management for holding this hearing and highlighting the importance of the resilience of the nation’s infrastructure.

Natural and man-made disasters have repeatedly demonstrated the vulnerability of the nation’s infrastructure. Congress and the Administration, as well as state and local governments, need to make addressing infrastructure vulnerability a major component of infrastructure initiatives and investments going forward. Such emphasis is critical to the nation's infrastructure and to the health and safety of American communities.

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[1] https://www.asce.org/templates/press-release-detail.aspx?id=39661

If you need more information or ASCE can be of further assistance, please do not hesitate to contact Martin Hight, ASCE's Senior Manager for Government Relations at mhight@asce.org or 202-789-7843.