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TESTIMONY OF

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FOR THE

NATIONAL INSTITUTE OF BUILDING SCIENCES
MULTIHAZARD MITIGATION COUNCIL AND
COUNCIL ON FINANCE, INSURANCE AND REAL ESTATE

TO THE

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SUBCOMMITTEE ON ECONOMIC DEVELOPMENT, PUBLIC BUILDINGS AND
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Chairman Barletta, Ranking Member Carson and Members of the Subcommittee, thank you for the opportunity to provide testimony on cost-effective opportunities to reduce the economic impacts of natural disasters through the establishment of new incentivization pathways and investments in mitigation strategies.

I am pleased to be before you in two capacities. I serve as Director of Professional Development and Geospatial Education at The Polis Center, Indiana University Purdue University Indianapolis (in Ranking Member Carson's district), and as the Chair of the Multihazard Mitigation Council of the National Institute of Building Sciences.

First, let me provide a little background on the Center and our work to advance resilience locally, regionally and nationally. Polis was formed in 1989 with the mission of linking academic and community expertise to create strong, resilient communities and to build their capacity to make effective, data-driven decisions. Our initial focus was the Indianapolis area. While we continue to have a strong commitment to Indiana, our work has grown to include national as well as international audiences. Polis partners span the public, private and not-for profit sectors. We are particularly skilled in the application of digital technologies such as Geographic Information Systems (GIS) and other geospatial tools to address issues facing the nation's communities.

The following are a few examples of the more than 700 projects that Polis has supported.

- We partner with The Indiana Department of Homeland Security (IDHS), regional commissions, and local community planners to develop multi-hazard mitigation plans in accordance with the federal Disaster Mitigation Act of 2000. Since 2003, we have led these efforts for nearly all of Indiana's 92 counties. This work includes qualitative and quantitative risk analyses, working with local communities to develop mitigation strategies, and developing the final plan.
- We have supported the State of Georgia's disaster planning since 2011. We work with the Georgia Emergency Management Agency, Department of Natural Resources, University of Georgia, Association of Regional Commissions, and other partners. We create tools and workflows that relate detailed local information about buildings and populations to the hazards that threaten them. We also provide extensive training to ensure in-state capacity to use these resources effectively. We facilitate collaborations among federal, regional, state and local organizations that have led to the development of data development and sharing strategies. We have also performed such work in Texas, Florida, South Carolina, West Virginia, and Puerto Rico.
- We have been involved with multiple aspects of FEMA's Risk MAP program which, as you know, is designed to improve flood-risk data and flood-risk awareness. In collaboration with the Indiana Department of Natural Resources (IDNR) we have led and partnered in multiple demonstration projects to test and refine Risk MAP concepts and products. We have also worked with FEMA and IDNR to help communities identify mitigation projects that could lead to increased resiliency from flooding impacts.
- Polis has been a leader in emergency management education since 2003. We have developed over two dozen courses for FEMA and offered classroom instruction, conference keynotes, and other presentations in over 100 cities in 36 states and multiple countries.
- We have developed the SAVI Community Information System (savi.org), the nation's largest, which provides more than 10,000 indicators about health, education, crime, and a host of other quality-of-life measures, as well as information on 19,000 community assets, for the 11-county Indianapolis MSA. SAVI is used widely in numerous community planning and improvement efforts, and we are currently exploring ways that we will be able to link its data to the issues that confront emergency management.
- Finally, we seek to broaden the meaning of disasters to include social conditions such as food insecurity, homelessness, and other problems that are made worse by natural disasters. We believe that local and national interests are best served when we can link the networks serving natural, social, and economic emergencies to provide a comprehensive response to conditions that disrupt and destabilize communities.

We will continue to work creatively with government, voluntary organizations, faith-based communities and others to advance the goal of enhancing the resiliency of the American people. In this effort, we are learning much about the ability of universities to work in partnership with local communities, linking academic and practical expertise to develop innovative and effective solutions to the problems brought by natural and social disasters.

I bring my strong interest in advancing resilience to my volunteer role at the National Institute of Building Sciences' Multihazard Mitigation Council, where it is my honor to serve as the 2016 MMC chair.

The U.S. Congress established the National Institute of Building Sciences in 1974 to serve as an authoritative source for both the public and private sectors to create a safe, healthy built environment across the United States (12 USC 1701j-2).

To achieve its mission to support promulgation of nationally recognized performance criteria, standards and other technical provisions for maintenance of life, safety, health and public welfare, the Institute has established a diverse portfolio of councils that engage building industry experts in examining and developing tools, technologies and practices to meet identified needs. The Institute and its Multihazard Mitigation Council (MMC) and Council on Finance, Insurance and Real Estate (CFIRE) have been particularly focused on opportunities to advance resilience and encourage the most cost-effective approaches to reducing the impacts of natural and man-made disasters.

Resilience¹ has come to occupy a place in public policy and programs across the United States (Kahan, p. 2). Yet, even in the face of growing losses and the deleterious effects of natural disasters, the nation's capacity and appetite is waning for continued funding of disaster recovery—particularly in the face of increased frequency and severity of disaster events. Despite the long-proven benefits of federal and state pre- and post-disaster mitigation² efforts to promote resilience, funding for these initiatives has remained small compared to the post-disaster recovery funding.

As the MMC identified over ten years ago, “money spent on reducing the risk of natural hazards is a sound investment. On average, a dollar spent by FEMA on hazard mitigation provides the nation about \$4 in future benefits.”³ While the Institute and the MMC believe this assessment is still accurate and compelling, we are in the process of conducting a follow-on study updating the benefits associated with FEMA investments in mitigation, adding the benefits of investments by

¹ As defined by the National Academies 2012 publication, *Disaster Resilience: A National Imperative* (p. 16), “resilience is the ability to prepare and plan for, absorb, recover from, or more successfully adapt to actual or potential adverse events.” This definition is considered by the National Academies to be consistent with the international disaster policy community (United Nations Office for Disaster Risk Reduction - UNISDR, 2011), and U.S. governmental agency definitions (Subcommittee on Disaster Reduction - SDR, 2005; Department of Homeland Security - DHS Risk Steering Committee, 2008; Presidential Policy Directive - PPD-8, 2011), and National Research Council (NRC, 2011). However, there is no one-size-fits-all definition of resilience; a variety of definitions has the benefit of providing users with flexibility in applying resilience in differing situations (Kahan, p. 6). The MMC and CFIRE recognize that definitions of resilience will vary from state to state and community to community according to local infrastructure, economies, demographics, governance and stakeholders. Incentivization is intended to work with and be tailored to any of these localized approaches to resilience. Whatever means communities devise for achieving resilience, the MMC and CFIRE will propose a way to incentivize it.

² In “*Natural Hazard Mitigation Saves: An Independent Study to Assess the Future Savings from Mitigation Activities, Volume 1 Findings, Conclusions, and Recommendations*” (p. 1), The National Institute of Building Sciences Multihazard Mitigation Council defines disaster mitigation as physical measures to avoid or reduce damage from disasters, such as elevating, acquiring, or relocating structures threatened by floods, and strengthening structures to resist earthquake and wind forces. Mitigation in the context of resilience allows structures and infrastructure, and, consequently, the economic and social processes associated with them, to be useful after a disaster.

³ Multihazard Mitigation Council. *Natural Hazard Mitigation Saves: An Independent Study to Assess the Future Savings from Mitigation Activities, Volume 1- Findings, Conclusions, and Recommendations*. National Institute of Building Sciences, 2005.

other federal agencies, and, for the first time, capturing the benefits achieved through investments in mitigation made by the private sector. Completion of the first phase of this effort is anticipated in the summer of 2017, pending receipt of funding.

Recognizing the significant benefits achieved through pro-active investments in mitigation; the multi-stakeholder engagement necessary to achieve community resilience; the limited funding available to support disaster mitigation, response and recovery; and the anticipated increase in disaster events, a new approach is necessary—one focused on capturing all of the potential incentives provided by both the public and private sectors for pre- and post-hazard investment. The most cost-effective manner to achieve resilience is through a holistic and integrated set of public, private and hybrid programs that capture opportunities available through investment in mortgages and equity real estate; insurance; finance; tax incentives and credits; grants; regulations; and enhanced building codes and their application. This focus on leveraging private/public-sector opportunities to induce corrective action is called “incentivization.”⁴

The current methods to incentivize investment in resilience rely on three primary mechanisms: federal grant programs (with some support from private foundations); insurance premium discounts for implementing measures to reduce vulnerability; and actions by local governments, either in the wake of a disaster or before an event occurs, through the foresight of community champions. While these approaches have provided a level of resilience, they have taken the nation only so far. Yet, as shown in Figure 1, the damage from extreme weather events has continued to increase in the past 35 years.⁵

Despite increased losses and the myriad benefits of investing in community resilience, federal assistance for resilience in terms of “pre-disaster mitigation” has actually declined over the past decade.⁶ More must be done before natural disasters hit to prevent sadly recurring aftermaths: the loss of life and injury to loved ones; families and children made homeless; irreplaceable possessions lost; curtailed ability of breadwinners to make income; businesses, built with hard work over the years, destroyed; and wrecked regional economies.

The incentivization approach calls for input, consensus, leadership and action from a broad spectrum of stakeholders representing the financial, regulatory and economic processes that need to be developed and coordinated to make incentivization part of the nation’s economic fabric. Such discussions need to occur at sufficiently high levels in the public and private sectors to ensure enactment. Participants should include those who offer incentives, such as insurance and finance-related companies, lenders and foundations, as well as forward-thinking communities

⁴ Multihazard Mitigation Council and Council on Finance, Insurance and Real Estate. *Developing Pre-Disaster Resilience Based on Public and Private Incentivization*. National Institute of Building Sciences, 2015.

⁵ Figure 1 is constructed from the reference: “NOAA National Climatic Data Center, Billion-Dollar Weather and Climate Disaster: Table of Events, National Oceanic and Atmospheric Administration,” <http://www.ncdc.noaa.gov/billions/time-series>. Costs are CPI adjusted. According to NOAA, cost estimates are rounded to the nearest billion dollars. Ongoing research is seeking to define uncertainty and confidence intervals around the cost of each event. Earthquake losses are based on an article by Gregory Wallace: “The Ten Most Expensive U.S. Earthquakes,” *CNN Money*, August 25, 2014, <http://money.cnn.com/2014/08/24/news/economy/earthquakes-10-most-expensive/>.

⁶ SmarterSafer, *Bracing for the Storm: How to Reform U.S. Disaster Policy to Prepare For A Riskier Future*, April 2015.

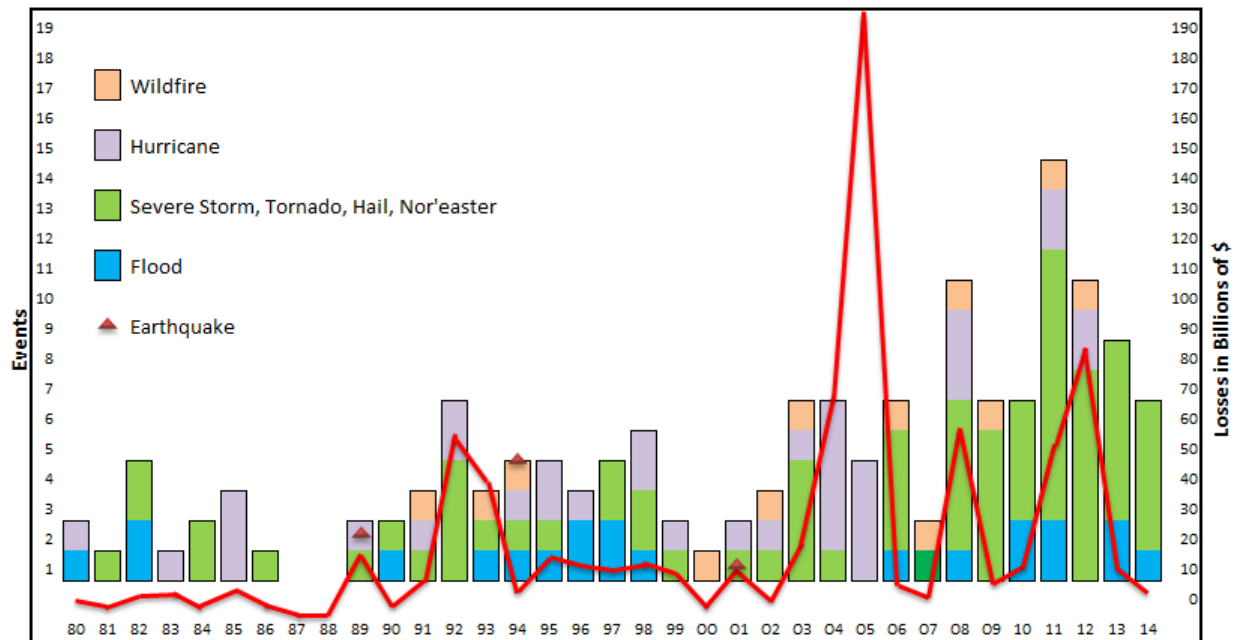


Figure 1: Billion Dollar+ Extreme Weather Events in Frequency and Losses from 1980-2014 (Earthquake Losses Included)⁵

and federal and state government agencies; and important decision makers, including utilities, homeowners and businesses should also participate.

The private sector will not undertake resilience investments just because it is sensible, but because it is economically prudent. Therefore, participating stakeholders need sufficient confidence that using incentives to achieve resilience will justify investments, underwriting and loan and grant programs. Decision makers want the certainty that they can offset the cost of implementing mitigation strategies. In this win-win scenario, all stakeholders should experience the expanded benefits and co-benefits of resilience, including reduced losses and operational continuity. Once incentives are adopted and standardized by leading private-sector stakeholders, the rest of the private sector should begin to follow.

Incentives should be an integrated set of solutions, and evolve with the changing field of resilience. Incentives programs should be developed to define entry points and streamline processes that can be easily understood and applied to ensure widespread usage and effectiveness. Incentivizing the means to achieve resilience before disasters occur focuses on monetizing the benefits realized by financial institutions and others for incorporating risk mitigation practices in the ordinary course of business.

While governments play an important role in disaster recovery, the need for recovery funding should be an option of last resort. Given the significant benefits of mitigation already demonstrated, all potential avenues to encourage such mitigation should be explored. MMC and CFIRE have identified key avenues to support mitigation investments which are summarized below.

- The interests of the insurance sector align substantially with pre-disaster concerns. Resilient buildings reduce the loss risks associated with property insurance issuance. Similarly,

building resilience strategies reduce the payouts for business interruption insurance, which frequently exceed amounts expended by insurers in compensation for property damage. Insurers can promote the adoption of enhanced, beyond-code mitigation standards for resilience [such as the Insurance Institute for Business and Home Safety (IBHS)'s FORTIFIED programs for residential and commercial buildings]. To incentivize the take-up of such standards, insurers can offer premium discounts to property owners who utilize the standards in construction or retrofit.

- Resilient properties also enhance the security of mortgage lenders. Therefore, banks and other lenders have perhaps the most potential to scale and transform the retrofit finance market by integrating performance-based resiliency requirements within their mortgage origination and refinancing programs. All other factors being equal, resilient properties constitute stronger mortgage loan collateral than less-resilient properties. This suggests that permanent mortgage loans on resilient properties, if pooled and sold as bonds, could enhance the credit quality of mortgage-backed securities.
- Developers and builders need to engage in resilience discussions, and realize that there is an untapped market for more-durable construction. From the property owner's perspective, a more-resilient property should increase the likelihood of securing debt financing. In addition, a more-resilient property—especially in areas prone to natural disaster—is likely to be more valuable than a less-resilient comparable property, thus resulting in enhanced sale prospects and (for commercial properties) better leasing performance.
- Corporate debt ratings, in appropriate cases, could recognize pre-disaster mitigation strategies. This approach would focus on companies whose assets are significantly concentrated in facilities or equipment in a single region or urban area prone to natural disasters, where such an event would have a profound effect on property loss and business discontinuity. Such companies would experience improved bond ratings, all other factors remaining equal, by adopting comprehensive resilience strategies. Similarly, industrial revenue bonds linked to the construction of resilient facilities in areas prone to natural disasters could realize enhanced ratings, other factors being equal.
- The development and adoption of appraisal and bond underwriting standards that recognize the valuation benefits of building resilience, all other factors being equal. Enhanced appraised values allow a borrower to leverage more mortgage financing for a given loan-to-value ratio. Conversely, for a specific loan amount, a more-resilient building will be better collateralized—that is, have a lower loan-to-value ratio—than a less-resilient comparable property. Similarly, bonds backed by resilient properties would carry higher ratings, thus minimizing interest expense to the issuer.
- Community investment decisions are not dissimilar to those in the private sector in that resilience to disasters positively affects a community's reputation as a place to establish and retain businesses. Resilience incentives for communities could consist of enhanced bond ratings for hazard-resistant municipal projects; the award of federal and/or state grants for the creation of either local mitigation grants, revolving loans or regulatory and tax programs that encourage resilience. Community regulatory and tax activities in support of resilience include the upgrade of local building codes; accelerated local permitting and inspection procedures for resilient properties; zoning benefits; more-favorable developer agreements for the construction of resilient properties; and more favorable tax treatment for resilient buildings and infrastructure.

- Utility incentives could include reduced insurance premiums to support the avoidance of interruption losses; a public utility commission policy that allows a small but immediate increase in rates to pay for system resilience enhancements; and enhanced bond ratings for projects that incorporate resilience strategies.

In order to assure the effective implementation of resilience strategies through regulatory and business-based decision making, stakeholders must determine the value of such strategies. They need better data and tools to identify localities with the highest risk, and to pinpoint where enhanced building code requirements and incentives would be most effective. New and improved software is needed to expedite the creation of financial products and other business processes that support incentivization. Stakeholders also need an enhanced flow of information to promote incentivization.

At the same time, a comprehensive incentives-based resilience framework must avoid disincentives, such as state insurance rate regulation that ignores risk-based pricing, which might limit the penetration of mitigation programs in the business arena.

All stakeholders are expected to experience substantial benefits of resilience following disasters—reduced financial and property losses; retention of business and employees, and related revenues after disasters; accelerated recovery and reduced recovery costs for owners, occupants and communities; reduction of resources required for relief and recovery; and, lessened demand on, and risk to, emergency response personnel and reduced expenditures for emergency response.

Beyond having more-resilient buildings and communities, stakeholders also may accrue additional economic benefits from establishing a system of private-sector incentives, including:

- Increased loan security for lending institutions and enhanced financing opportunities for borrowers and investors in buildings and infrastructure.
- Heightened stability in the insurance and reinsurance industries.
- Increased construction activity and jobs associated with achieving resilience.
- Enhanced community abilities to attract and retain quality developers and businesses.
- A reduction in the amount of damaged and contaminated materials and contents after a disaster event, which initially may pose health hazards and then must be disposed of in landfills or by incineration.

Even beyond the benefits listed above, the businesses themselves and society at-large can benefit from the added value of co-benefits—that is, the indirect benefits that arise from heightened resilience. Businesses, for example, can capture resilience-related image improvements, which can lead to an increase in long-run profits.⁷

While incentivization serves as a strategy to realize resilience goals, the identification and implementation of effective mitigation measures is paramount. Some of the most effective

⁷ See Rose. Co-benefits often occur irrespective of the occurrence of any disasters—a “no-regrets” strategy—that reaps benefits irrespective of future outcomes (p. 17). Co-benefits need to be expressed in monetary terms, so they can be viewed in the light that most businesses understand (p. 24).

mitigation strategies are outlined in Table 1. Specific mitigation measures are described with a relative magnitude of benefit-cost expected through their implementation. The specific cost-benefit ratio of these and other measures will be identified in the forthcoming revision and expansion of the *Mitigation Saves* report.

Table 1: Leading Mitigation Options

| | Flood | Wind | Earthquake | Wildfire |
|--|--|--|---|--|
| Residential | Elevate (Mh), remove (Hh), levee enhancement (Hh) | Shutters (Hh), roof-wall straps (Mh), roof-deck attachments (Mh), secondary water resistance (Mh), engineered tie-down systems for manufactured housing (Mh) | Brace cripple walls (Hh), strengthen soft story (Mh), secure water heater (Hm), secure furnishings and contents (Hh), purchase insurance (MI), engineered tie-down systems for manufactured housing (Mh), drop-cover-and-hold-on training (Lh), emergency plan (Lh) | Adopt International Wildland-Urban Interface Code (Lh); require sprinklers in high-rise buildings (Lh) |
| Commercial | Remove buildings (Hh), elevate equipment (Mh), protect entrances (Lm), enhance levees (Hh), insure (Mm) | Shutters (Hh), roof-wall straps (Mh), roof-deck attachments (Mh), secondary water resistance (Mh); insure (Hm) | Secure MEP equipment (Hh); brace ceilings (Mh); secure furnishings, fixtures & equipment (Hh); BCP (Hh); insure (Mm); drop-cover-and-hold-on training (Lh) | Like residential |
| Industrial | Like commercial | Shutters (Hh), roof-deck attachments (Mh) | Like commercial | Like residential |
| Utilities and Transportation Lifelines | Elevate high-voltage transformers (Lm), stockpile replacement components (Lm), high-capacity culverts at road crossings (Lm) | Underground transmission and distribution lines (Mh), stockpile replacement components (Lm) | Accelerate pipe replacement (Hh), replace fragile equipment (Hh), secure equipment (Hh), adopt fuel management plan (Lh), greater design strength (Lh) | Like residential |
| Government | Like commercial | Like commercial | Like commercial | Like residential |

Terms in parentheses (Xy) refer to recent expenditures (X: H = high, M = medium, L = low) and likely benefit-cost ratio (y: h = high, m = medium, l = low)

Building Codes

The consistent adoption and enforcement of up-to-date building codes is the fundamental means of providing the nation with a baseline level of protection from disasters. However, many states and communities either lack codes all together or are on outdated versions of the code. While adoption of the code is important, effective enforcement is key to realizing the protections intended by the code.

Building codes are developed through a national model process, but ultimately amended and adopted by state and local governments. However, given the potential financial exposure post-disaster and the impact on the nation's citizens and its economy, the federal government should maintain a strong interest in the development, adoption and enforcement of building codes. Federal participation in the national code development process (and at state and local development and adoption processes where federal science findings can be applied) would be valuable in assuring federal priorities and federal agency-supported science are recognized.

In addition to all relevant federal funding at the community or project level coming with requirements to meet or exceed the latest building codes, the federal government can provide additional support to encourage the adoption and enforcement of current building codes. As states and localities struggle to address their fiscal constraints, training budgets are often one of the first items cut. Code officials are particularly impacted by such cuts since codes are regularly updated to reflect new technologies and practices. The recent recession has exacerbated this issue by reducing the code official workforce and placing an increased burden on those who remain as construction volumes pick up.

Federal support for training of code officials and providing technical assistance for both adoptions and enforcement will provide important signals to state and local governments.

Above-Code Provisions and Programs

While building codes set a minimum level of protection, there are certainly enhanced benefits for those communities or building owners that incorporate requirements that go beyond existing codes. Communities and building owners that implement such above-code options should be recognized based on their reduced exposure to a hazard.

Preliminary estimates by MMC experts suggest that designing buildings to be 50% stronger against earthquake loads and 50% higher against wind loads can increase costs on the order of 1%. The greater strength may reduce building impairment (collapse, red-tagging and yellow-tagging) by a factor of four in a large earthquake and by a factor of ten in tornadoes.

Following devastating tornadoes, the City of Moore, Oklahoma, implemented enhanced windspeed requirements, along with 11 detailing requirements, to ensure that buildings can resist all EF-1 and 2 tornadoes, which comprise 85% of all tornadoes affecting Oklahoma, and much of the footprint of the remaining EF3, 4 and 5 tornadoes. The City of Moore's 135-mph basic windspeed requirements makes buildings 125% stronger than under its previous code and 38% stronger than under current American Society of Civil Engineers/Structural Engineering Institute (ASCE/SEI) 7-10 *Minimum Design Loads for Buildings and Other Structures* requirements. The City of Moore

estimates that the code change costs on the order of \$1 per square foot, which is roughly 1% additional construction cost. It therefore seems practical and potentially cost-effective for much of the rest of the United States, especially in tornado-prone portions east of the Rocky Mountains.

Existing Building Retrofits

While building codes and above-code programs are highly effective in advancing the resilience of new construction and major renovations, existing buildings make up the vast majority of the building stock. Implementing mitigation measures in existing buildings is essential to realizing community-level resilience.

In many cases, the business case for retrofit is significant, but often unclear to decision makers. Effective incentivization strategies can help address this disconnect.

One notable and oft-cited example is the seismic retrofit of Anheuser Busch's Van Nuys brewery. It underwent a retrofit program costing \$11 million (slightly less than 1% of the total facility replacement cost) in the 1980s, just prior to the 1994 Northridge earthquake. Anheuser-Busch estimated that their facility would have suffered a direct property loss of about \$350 million from the Northridge earthquake had there been no seismic strengthening, or \$750 million, including business interruption losses—over 60 times the cost of the mitigation program (EQE International, 1999).

San Francisco's Community Action Plan for Seismic Safety (CAPSS) led that city to adopt mandatory strengthening of soft-story, high-occupancy wood-frame buildings (Porter, p. 4), which house 8% of the city's population. Local financial institutions have supported the CAPSS loans for mandatory retrofits because of their dedication to having operations in the city (Rodin, p. 145). The City of Los Angeles developed a highly publicized earthquake plan, *Resilience by Design*, that advocates mandated retrofit of soft first-story buildings and concrete buildings built before the 1976 *Uniform Building Code* was enforced (Mayoral Seismic Safety Task Force, pp. 39 and 44).

FEMA could create a component under the pre-disaster mitigation grant program that would allow local communities to receive grants and distribute funds to private businesses and/or residents to implement approved mitigation strategies. Alternatively, a community could use grants to support a low-interest loan program that allows longer-term investment in private-sector mitigation, both for businesses and residences. Such a program could fund local governments to provide revolving loans to property owners. Repayment and interest funds would then be re-invested in other properties, thereby creating an on-going program.

Lifelines and Utilities

A recent Institute project for the Department of Homeland Security Office of Infrastructure Protection looked at the opportunity to support community resilience by development of a Critical Infrastructure Security and Resilience Risk Management Process (CISR-RMP).⁸ This CISR-RMP

⁸ See *The Case for a Business Process Engineering Approach to Managing Security and Resilience Of Lifeline Infrastructures and Regional Communities* (https://www.nibs.org/resource/resmgr/IRDP/CISR-RMP_WhitPpr151116.pdf) for a summary of the project and *A Business Process Engineering Approach to Managing*

is intended to provide a workable, scalable, repeatable, defensible, integrable and practical process that lifeline critical infrastructures (CIs), local governments (especially emergency management) and regional public-private partnerships (P3s) or coalitions can use collaboratively to rationalize the allocation of scarce and constrained resources for security and resilience. Such a process would be fully integrated with on-going, significant business processes, such as asset management, continuity planning and capital development planning and budgeting, to assure risk management becomes a standard, routine business practice and avoids duplicative data collection or evaluation processes.

Significant portions of the human, material and economic losses from disasters occur because such events disrupt the delivery of vital services of lifeline CIs, including energy, water and waste water, transportation and communications. Without these CIs, communities can neither recover nor long survive. Any one infrastructure is interdependent with others, so the direct loss of one is exacerbated as an initial failure cascades to other infrastructures in a “chain reaction” that can spread losses widely throughout a region and beyond. Additionally, such infrastructures face long-term underinvestment in maintenance, rehabilitation and replacement, even as population and demand for their services increase. This underinvestment has stretched existing infrastructures to meet higher demand by operating closer to their design maxima and keeping aging facilities in service well beyond their design lives, making them more vulnerable to whatever hazards may occur.

Some large and forward-thinking jurisdictions and utilities have adopted sophisticated risk management as standard operating procedures—often using unique, proprietary or narrowly threat-specific risk analysis methods that cannot readily be transferred or integrated. Outside of these, most lifelines and local jurisdictions have actually performed very little risk analysis that leads to significant decisions and no resilience analysis beyond continuity of operations/continuity of government planning. Most jurisdictions and lifeline operators have chosen to simply comply with federal and state requirements (often at a cursory level), or treat risk management as a periodic exercise (e.g. five-year special event). Several stated that requirements from an external authoritative source (e.g., higher government, industry standards, or regulatory agency) can ease the allocation of the time and limited funds to risk analysis because it removes the need to justify the effort.

One reason for the limited use of risk analysis tools is the widely held belief among local agencies and publicly owned utilities that if disaster strikes, the federal or state governments will step in to pay for the majority of the costs of recovery and restoration, thus discounting the value of investments in prevention, protection or pre-event mitigation. One respondent went so far as to say, “Investing 100-cent dollars of local taxpayer or ratepayer money *before* a highly uncertain future event seems irrational compared to paying 25-cent dollars of local taxes [the typical local share, with 75% from the federal government] *after* the event has become a certainty, *if and when* it ever does.”

A near universal issue, especially in the private sector, is fear of legal liability and negligence suits associated with conducting risk analyses and then experiencing casualties or damages due to a known risk that was determined to be too low a priority to justify investment. Another issue is the

costs associated with identifying risk that requires substantial investment to mitigate, but little or no incremental revenue or routine cost savings.

To support an effective CISR-RMP, the following components are required:

- Compatible risk and resilience tools across sectors to support comparability, interdependencies analysis and roll-up into increasingly larger pictures of community, state, region and national resilience.
- Tools developed through research, development and deployment efforts with long-term support, accompanied by development of a detailed protocol for defining the minimum effective set of data, and establishing confidentiality safeguards and penalties for violations.

Conclusion

In recent years FEMA, other federal agencies and private-sector organizations have been engaged in an effort to identify ways to reduce the impact of disasters on the American public and the infrastructure within our communities. Even before this effort, the Institute had been working on providing guidance and science to improve the built environment and strengthen our buildings and infrastructure against all hazards, natural and man-made. While these efforts have made significant improvements in building codes, new construction and some local communities, they have not penetrated privately owned property as much as we would like. Government can only do so much, and the remainder requires incentivizing private property owners into making the necessary steps. To that end, government can help or hinder progress with the policies it implements. Removing existing impediments can help spur private-sector entities to adopt incentives that can lead to increased resilience and the subsequent reduction in losses. Likewise, new regulation could stifle progress and increase the long-term costs to the American taxpayer. This testimony provides a pathway or roadmap for the creation of incentives that could move hazard mitigation forward. Your assistance with removing obstacles and providing good public policy and leadership is necessary to help move all of the stakeholders in the right direction.

This testimony has identified many possible incentivization strategies to support mitigation against hazards. The next step is implementing the public-private incentives to support resilience. These include expanding existing programs or creating new programs (such as those modeled on successful green building programs); and developing supporting business and investment processes, programs tailored to utilities and community-based initiatives. With these approaches, resilience should become part of accepted business practices, and integral to maintaining and enhancing the nation's economy.

Recommendations for Congressional Action

- Support the development and adoption of current, strong building codes by:
 - Requiring all construction projects provided with federal dollars meet or exceed the latest building codes.
 - Requiring all states and localities that receive funding associated with community development, infrastructure, public safety or community governance to adopt and effectively enforce building codes that meet or exceed the latest building codes. The

- requirements to adopt and enforce energy codes as required by the American Recovery and Reinvestment Act resulted in a marked increase in code adoptions.
- Requiring all buildings that house federal employees (whether leased or owned) to meet or exceed the latest building codes at the time of first occupancy and after subsequent substantial renovations.
 - Establishing a cross-agency [DHS/FEMA, the U.S. Department of Housing and Urban Development (HUD), National Institute of Standards and Technology (NIST), U.S. Department of Energy (DOE)] program focused on providing scientific and economic data associated with the effectiveness of building codes and their impacts on communities, education and training for code professionals, technical assistance and evaluation tools for code department effectiveness.
 - Requiring federal agencies to actively engage in the codes and standards development process, alongside industry stakeholders, to assure the consideration of federal priorities and the incorporation of federally supported research findings. [For example, the Building Seismic Safety Council (BSSC) Code Resource Support Committee (CRSC) under the sponsorship of FEMA monitors and contributes to the model codes and standards development process particularly, for the *International Building Code* (IBC), the *International Existing Building Code* (IEBC) and the *International Residential Code* (IRC) to ensure that they remain substantially equivalent to the latest edition of the *NEHRP Recommended Provisions* as defined by the ICSSC under Executive Order 13747 as well as other FEMA earthquake design guidance publications for new and existing buildings. The CRSC also supports related activities such as outreach and education materials to ensure that seismic hazards continue to be addressed. The CRSC also develops and submits changes on material that is not (or is inadequately) addressed by the *NEHRP Recommended Seismic Provisions* in other relevant standards publications. The CRSC works with representative organizations, such as ASCE, IBHS, National Association of Home Builders (NAHB) and Structural Engineers Association of California (SEAOC), to identify and address these issues. FEMA should develop coordinated training for code officials at the federal level—as is done for fire officials at the National Fire Academy.]
- Encourage investment in mitigation by the private sector through enhancing existing federal programs by:
 - Expanding federal home renovation programs to include mitigation improvements.
 - Reducing interest rates for residential mortgages, provided through Fannie Mae and Freddie Mac, on properties built to approved mitigation standards. This approach was recently introduced by Fannie Mae for mortgages on green-certified residential properties.
 - Encouraging the Securities Exchange Commission to recognize investments by resilience-based real estate investment trusts (REITs), private equity funds and bond issuances. Resiliency strategies would reduce investment risk and improve portfolio operating performance. Congress may also wish to require disclosure of vulnerabilities to disasters in SEC filings.
 - Incorporating technical assistance and resilience requirements into Small Business Administration (SBA) loans, guaranteed by the federal government and made by private lenders or community development financial institutions,

- to finance building resiliency upgrades. SBA loans are already a key source of building acquisition and renovation financing for small businesses, although such loans lack specific resiliency requirements.
- Offering federal tax incentives for building owners participating in mitigation programs. Such incentives can parallel those provided for energy efficiency and green buildings.
- Offering federal grant programs to support participation in approved mitigation initiatives.
- Federal investments and programs should reflect the importance of investment in mitigation by:
 - Encouraging federal, state and local agencies to share their resilience strategies (to the extent practical) with the private sector to both demonstrate what is possible and to build private-sector demand and capacity. Include the anticipated life-cycle costs where appropriate.
 - Funding federal agency mitigation programs at a level commensurate with the future exposure avoided.

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