Transportation and Infrastructure Committee, U.S. House of Representatives
The Business Case for Climate Solutions

Testimony of Tom Lewis, PE, JD – Climate, Resilience and Sustainability Executive Leader, WSP USA
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INTRODUCTION: MEETING THE MOMENT AND BEING A POSITIVE FORCE MULTIPLIER

Mr. Chairman and Committee Members, my name is Tom Lewis and I am a licensed civil engineer and the Climate, Resilience and Sustainability (CRS) Executive Leader for WSP USA. My position at WSP USA was recently created to meet this critical moment in history by coalescing our many like-minded, multidisciplinary climate, resilience and sustainability professionals.

The primary objective of the new business line is to enable WSP USA to be a force multiplier for positive organizational and infrastructure systems change. Our team recognizes that our country and planet are at a critical inflection point that demands focused and effective climate impact mitigation and adaptation. I enthusiastically accepted the opportunity to transition out of my role as WSP USA Federal Programs sector president to lead our CRS team, because the role builds on my personal passions, and benefits from my career-long advocacy for infrastructure sustainability, resilience and environmental stewardship, and my leadership on multiple industry boards. The vision and mission of CRS directly aligns with the goals of this hearing.

WSP USA is the U.S. operating company of WSP Global, one of the world's leading engineering and professional services firms with more 50,000 employees worldwide. Dedicated to serving communities, governments and the commercial sector, the firm comprises engineers, planners, environmental specialists, strategic advisors, project and program managers, and construction and operations management professionals. With more 10,000 employees across the country, WSP USA provides solutions in the transportation, buildings, energy, water and environment markets. The CRS business line is the ideal platform to support climate action and resilient infrastructure in communities nationwide.

THE QUESTION AT HAND

The foundational question being discussed in the hearing today is the appropriateness of incorporating considerations of climate change into investment decisions, or the business case for such action. Do investments in sustainability, emissions reductions and resilience make sense, and how should they be considered by this body? Stated simply, the business case from my perspective is:

- Designing, operating and maintaining infrastructure that draws fewer natural resources is an efficiency measure, and more reliance on sustainable energy sources extends the natural resources of the U.S. to future generations.
- Requiring construction of infrastructure that is resilient to current and future events ensures:
  - the federal government won't have to go back into communities to provide duplicative repair on impacted assets after an event; and
  - the long-term maintenance and repair of the system once turned over to state and local agencies won't place a heavier burden on them, as state budgets are stretched to the extreme.
- Communities and businesses can more quickly be brought back online after a disaster event with energy, water and transportation systems operating to facilitate recovery.

A VALUE-ADDED HOLISTIC PERSPECTIVE: INFRASTRUCTURE FOR THE FUTURE

At WSP USA, we assess, plan, design and manage Future Ready™ infrastructure for our U.S. clients and partners that more effectively anticipates forthcoming needs and conditions, and therefore provides a high level of sustainable and environmentally sound service for many generations.[1]

During the lifespan of infrastructure, technologies and societal needs will radically change. Likewise, the climate will continue to change, bringing more extreme weather and the inevitable phase-down of fossil fuels. We

[1] https://www.wsp.com/en-CA/who-we-are/future-ready

recognize that design codes and standards are often slow to change, and in many cases do not consider current and future conditions, which are materially different than the existing conditions at the time of the asset's development. For example, in many cases we have found the design of infrastructure still reflects design parameters based on outdated relationships between asset performance, user demands, climatological trends, environmental influences, and other conditions that could affect the useful life and the level of performance of that asset.

As a firm that works across all types of infrastructure and all phases of its lifecycle for government and non-government clients, WSP USA has a clear view on the state of infrastructure and a unique multi-dimensional perspective on the business case for climate solutions in infrastructure development. We provide services that support both climate mitigation through greenhouse gas (GHG) reduction and climate adaptation through infrastructure resilience and nature-based solutions. From that educated perspective, it seems clear that we as a society need to make the case for justifying funding and investment decisions on the technical and benefit-cost merits that result in our infrastructure being more adaptive, sustainable and resilient to future climatological, environmental, technological and societal trends.

WSP USA has worked on many of our country's largest and most important government and public-private-partnership (P3) infrastructure projects supporting road, bridge and tunnel improvements, rail and transit expansion, airport upgrades, renewal of ports, and water and power network modernization in a way that makes a positive impact on communities and the environment. These projects often include considering multiple aspects of potential climate disruptions, including preparing for resilience, improving efficiency and sustainability, and ensuring social justice in new designs and development.

At the same time, WSP USA also works for some of the most innovative and climate-focused private companies in the U.S. and worldwide. These companies include investors funding highly progressive projects and technologies, airlines looking to fly using biofuels today and hydrogen tomorrow, information technology providers finding new ways to store data in ways that reduce demands for water and cooling, and financial institutions looking

to make their portfolios more reflective of the "green transition" and with due consideration of the social cost of carbon. Often, the solutions developed for and employed by these innovative private clients can be, and are, adapted for use by our government clients.

CREDIBILITY: WALKING THE TALK AS A COMPANY

As an example of how a more adaptive and flexible approach to future climate conditions can be formalized as part of engineering decision-making, WSP USA trains all its hires in its Future Ready program to inspire and empower our employees to design for future resilience, adaptability and sustainability. By considering current, emerging and anticipated trends in future climatological and environmental conditions, the Future Ready approach helps our employees develop infrastructure solutions and organizational improvements for the benefit of the communities in which they live, work and serve.

To show how this can be done for greenhouse gas emissions reductions, WSP USA became carbon neutral across our operations in 2019. As a result of this and other progressive improvements within our organization, we were recognized by World Finance Magazine as the most sustainable company in the engineering industry for both 2019 and 2020. Further, in February 2020 WSP became the first professional services firm to sign onto a recently created sustainability-linked credit facility in the Americas. The agreement applies to a $1.2 billion credit facility and includes three key performance metrics to document our ongoing commitment to be a sustainable leader in the infrastructure industry and society more broadly, including:

- Reduction in operational greenhouse emissions between 2018 and 2021;
- The percentage of our services having a positive effect on the environment; and
- The percentage of women in management positions.

As further described in the following section, in 2020 WSP USA — in collaboration with the American Society of Civil Engineers (ASCE) and others — launched the International Coalition for Sustainable Infrastructure (ICSI). The company is also a founding organizer of www.pledgetonetzero.org, a program designed to galvanize our consulting

industry to take on climate action even more directly, while we guide our clients on their own net zero carbon progress. Pledge to net zero is now one of the United Nation's (UN) Race To Zero partners ahead of the pivotal 26th UN Climate Change Conference of the Parties (COP26), scheduled for November 1-12, 2021 in Glasgow Scotland. Pledge to net zero requires three commitments:

1. Commit to at least a 'well below 2° Celsius' science-based target under the SBTi (Science Based Targets initiative - a non-profit facilitated collaboration involving the UN Global Compact, World Resources Institute (WRI) and the World-Wide Fund for Nature (WWF),
2. Publicly report emissions; and
3. Publish at least one piece of thought leadership each year.

A COALITION OF ENGINEERING ORGANIZATIONS: BRIDGING THE GAPS WITH PRACTICAL ACTION

For thousands of years, civil engineers have been imagining, designing and building infrastructure that has allowed humans to congregate and interact, explore and thrive. Their ingenuity propelled the growth of human civilization and paved the way to the present. Yet advancement has come at a high cost, economically and environmentally.

In order to fuel our modern lifestyles, we are unsustainably expending the resources of our natural environment. The rate of non-renewable natural resource extraction such as minerals, precious metals and fossil fuels, as well as post-extraction manufacturing and combustion, have led to unprecedented impacts on the world's climate and ecosystems. Based on the latest global scientific consensus from the Intergovernmental Panel on Climate Change (IPCC), the world's global average temperature has risen 1.1° Celsius since the industrial revolution. This trend will have major ramifications for our nation's and the world's infrastructure under any scenario, but if left unchecked it could be catastrophic to civilization and natural habitats as we know them.

Transportation is the lifeblood of our economies and is also the leading contributor to greenhouse gas emissions in the U.S., accounting for approximately 30 percent of the nation's total emissions including cars, trucks,

airplanes and other transit modes. Our national approach to repairing and maintaining roads, bridges and other transportation infrastructure must urgently consider new assumptions to accelerate how we design, measure, manage and invest in infrastructure to achieve both resilient and adapted standards and the transition to a low or net zero carbon economy that fully considers the physical and social impacts of carbon and other GHG emissions.

Given this urgency, I along with Seth Schultz (currently the Executive Director of The Resilience Shift), envisaged a "Future World Vision Leadership Summit" hosted in late 2019 by the ASCE and its non-profit ASCE Foundation. The idea was realized in November 2019 as a highly successful summit attended by leadership from WSP USA, the Resilience Shift, ASCE and more than 35 other infrastructure stakeholders from around the U.S. and the world — five other major engineering firms and two major infrastructure construction firms, two major transportation/transit agencies, six major municipal/county infrastructure agencies, the U.S. Army Corps of Engineers, three top universities and three leading non-governmental organizations (NGOs).

As a direct outcome of the leadership summit, more than 100 individuals from dozens of organizations signed an open letter of commitment to action that in turn led to the 2020 launching of ICSI, with the letter of commitment stating:

> "The global population will face unprecedented challenges over the next 50 years, from rising seas to more frequent extreme weather events, all of which will happen against a backdrop of significant demographic changes and technology advances. These global trends are already posing well-documented challenges,
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> Practical solutions are needed in order to adapt our infrastructure, close the resilience gap and breakdown barriers to action. While there has been some progress in developing favorable environmental, economic and social policy to lessen the impacts of the changing climate, we need a larger scale commitment among all stakeholders, especially engineers, to:
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> - Identify, prioritize and better understand the gaps and barriers for the planning, designing, building, maintaining and operating sustainable and resilient infrastructure now and in the future;
> - Cultivate and unlock the full potential of untapped partnerships and funding investments designed

to reduce the impacts of extreme weather events, create sustainable and resilient infrastructure, and effect social change; and

- Understand and identify practical plans of action and resources for implementing strategies that influence realistic short-term goals and have measured, long-term effects.

We the undersigned commit to unite forces and bring our relevant expertise and resources to a Coalition for Sustainable Infrastructure."

I am extremely proud to be one of the five founding board members for ICSI as WSP USA's representative, along with representatives from the ASCE and its Foundation (Chair), the Resilience Shift (Host), the Global Covenant of Mayors for Climate and Energy (GCoM), and the Institute for Civil Engineers (ICE). ICSI's vision ("Engineering a more sustainable, just and resilient future") and mission ("Mobilizing an engineering-led coalition to make resilience and sustainability a cornerstone of every decision in the infrastructure lifecycle in every community around the globe") and is perfectly on topic for this hearing, and so I am happy to add the ICSI perspective into my further testimony below.

MAKING THE BUSINESS CASE FOR CLIMATE-FOCUSED INFRASTRUCTURE SOLUTIONS

If we are serious as a society about future proofing our essential structures and infrastructure systems, we must employ a risk-based and community-engaged framework, while considering both the public and private sectors as partners providing integrated and complementary solutions. Much of the risk that private entities face from climate-related events is the result of dependencies on public infrastructure that support community functions, such as transportation systems, parks and water supply. Likewise, many governmental functions depend on the reliable and consistent provision of primarily privately provided networks such as the electrical grid, fuel supply, mobile communications networks and internet fiber.

Meanwhile, the evidence in the U.S. from FEMA, and globally from the UN, is very clear and compelling that a dollar spent proactively on infrastructure risk mitigation and better climate adaptation pays itself back four or more

times over in the form of greatly reduced, or even wholly avoided, response and recovery costs retroactively spent in the wake of future extreme weather disasters and chronic sea level rise.

We are all interconnected and are likewise at risk of interrupted service. In resilience parlance, there are potential cascading effects of weather-related disruptions to service. Disruptions of the power grid, for example, cause disruptions to electrified systems (e.g., traffic signals) that in turn negatively impact the orderly movement of people and vehicles on the road network that then negatively impacts public health, safety, and well-being. This interdependency was recently illustrated with the extreme cold weather event in Texas that caused the gas supply networks and electrical grid to largely fail, resulting in serious water shortages and other negative public service impacts (including the shut-down of COVID-19 testing and vaccine sites) throughout the State.

I consider "making the case" for climate solutions as the most important and pressing challenge of our time for infrastructure-related industries. Considering future uncertainty and risks have been part of investment decision-making for decades, but now it needs to be taken even further.

Engineers, for example, have developed methodologies and technical approaches that reflect uncertain futures with respect to the physical forces that assets might face in the future. The concept of future year conditions, e.g., the 100-year flood, have been an important input for infrastructure design for generations. However, never has there been such high levels of risk to uncertain environmental futures. Over the past 15 years, we have seen unprecedented and evermore frequent extreme weather events that have significantly affected our nation's infrastructure and the use of this infrastructure, and credible projections of future climate and weather conditions suggest that such events will be more and more common.

The ability for the economy in general and our infrastructure budgets in particular to recover from major disasters (including the ongoing pandemic) is increasingly strained. According to the National Oceanic and Atmospheric Administration (NOAA), 2020 saw 22 weather/climate disasters that yielded economic losses in excess of $1 billion. This is the highest number of such events recorded over the last 41 years and resulted in total costs in excess of $100 billion and the tragic deaths of some 262 people. The National Flood Insurance Program

and other private insurance products have been further strained and are ill-equipped to handle all these disruptions.

In fact, the world's largest reinsurance company (Swiss Re) believes that economic and insured losses resulting from severe weather events pose a major threat to global resilience. They state that the insurability of weather risks could ultimately be jeopardized, particularly in the most vulnerable, high-exposure accumulation areas. The resultant cost of near-term disaster response and long-term recovery to taxpayers continues to rise as we repeatedly repair damages and often rebuild to past design standards that are shown to be inadequate.

The engineering community has learned many lessons from the aftermath of these weather events, and how one can better "climate proof" future designs through lower carbon "gray infrastructure" (e.g., roads, bridges, tunnels, ports, airports) and with more use of "green infrastructure" (nature-based solutions and other cost-effective, resilient approaches to provide functional, climatological and community benefits). However, as is common in infrastructure decision-making, many trade-offs are considered within funding decisions tied to design options. In the context of future-proofing built assets, we have often found that the additional costs are traded off against focusing investment on today's needs. One of the important messages from my testimony is that this trade-off does not have to be and should not be mutually exclusive.

Our experience is that in many cases an added increment to a project budget for future proofing will provide protection against possible disruptions due to extreme weather events. There are many examples of where this has been done for a variety of reasons in infrastructure engineering. For example, the Oregon Department of Transportation (ODOT) in the early years of seismic retrofits for bridges (before Federal funds were available to support such projects) allocated additional funds for bridge rehabilitation projects in order to make incremental design changes that would provide better protection against an earthquake. A State-funded study had shown that a major earthquake in Oregon would likely damage many State highway bridges to such an extent that supply and recovery efforts via highways would be severely constrained, resulting potentially in additional lives lost and substantial costs to the State's economy. For an average of about five percent of the original project cost, incremental design changes were made to add more protection against such a possibility. In other words, ODOT

officials had successfully made the business case through tangible benefits for this type of incremental investment.

Other public agencies and programs are adopting a similar approach to create infrastructure with the vision that it will provide a greater public good now and for future generations and in order to preserve existing assets against changing future conditions. The Massachusetts Department of Transportation is creating inland and coastal flood modeling that incorporates future climate change and changing precipitation patterns into a predictive physical risk model that will enable better planning and design for decades to come. Miami-Dade County is planning a major capital program to address changing conditions, including installing pumps to deal with street flooding, and working to remove septic tanks which are being made ineffective by rising groundwater. North Carolina DOT has developed a rainfall warning system that predicts areas of flooding and washouts so that they can have advanced coordination with state police on road closures due to safety concerns. Communities in coastal Louisiana and Alaska have started planning for inland migration away from flooding that is occurring more and more regularly and damaging communities. These agencies and others are expanding their planning and decision-making to consider future changes in order to provide long-term and transformative benefits for their residents.

I recognize that the title of this hearing is "The Business Case for Climate Solutions." We have shown in our work that such a business case can be made where the financial benefits over the long run of protecting assets exceeds the near-term costs of adaptive designs. However, in the public sector, other non-monetary benefits or societal costs are often part of the decision. For example, technical studies of the potential disruptions to the road network assign dollar estimates to the replacement costs of the disrupted asset, the cost of additional travel time and vehicle operations for detours around the blockage, and the cost of associated fatalities and injuries. A broader perspective has sometimes been used to more fully understand the economic costs to surrounding communities of loss of connectivity or to the delays in supply chains dependent on the road that cannot in the short term after a disaster event handle trucks delivering goods. An even broader perspective would include non-monetary considerations relating to loss in quality of life, public health and social impacts, and concerns relating to providing equitable governmental response to the disruption.

This broader perspective is at its core a key sustainability concept, which fundamentally views today's decisions in the context of how they affect the quality of life of future generations. Sustainability does not rely on a cost-centered, design for capital projects and budgets process. Instead, it views such decisions from the holistic, life-cycle perspective in consideration of both monetary and non-monetary factors. Sustainability is not only applicable to public decisions; many corporations that WSP USA advises have adopted it as a central principle in their business model and our government institutions and agencies can learn from and leverage the positive experiences and approaches from such corporations.

MORE FUTURE FOCUSED CODES, STANDARDS, TOOLS AND DECISION-MAKING

The future will continue to bring stark new realities when it comes to climate change and impacts on our Nation's infrastructure. The engineering community that WSP USA is a part of is critical for developing practical solutions as part of a path forward that recognizes future uncertainty. Engineers are critical for creating and employing more fitting and forward-looking codes, standards and tools, which in turn will help establish more modern and effective frameworks for achieving better funding and project selection decisions that ensure projects are not just "shovel ready" but are also "shovel worthy." Specifically, these codes, standards and tools relate to the capacities, locations, design, construction and operation of roads, bridges, tunnels, water treatment plants, power plants, ports, airports, railways, transit and other community infrastructure systems. In the U.S., an excellent example of this is the evolution and ever-expanding use of a tool like Envision from the Institute for Sustainable Infrastructure (ISI) that WSP USA employs. ISI is an educational nonprofit that was established in 2010 by ASCE, the American Public Works Association (APWA), and the American Council of Engineering Companies (ACEC), who collaborated with the Zofnass Program for Sustainable Infrastructure at the Harvard University Graduate School of Design (ZPH) to develop Envision (also noting that I am an active, long-time Advisory Board member for ZPH). Envision provides a consistent, consensus-based framework for assessing sustainability and resilience in infrastructure. Envision:

- Sets the standard for what constitutes sustainable infrastructure;
- Incentivizes higher performance goals beyond minimum requirements;
- Gives recognition to projects that make significant contributions to sustainability; and
- Provides a common language for collaboration and clear communication both internally and externally.

Fundamentally, Envision is about supporting higher performance through more sustainable and resilient project choices and designs so that we "build the right projects" in addition to "building projects right."

An excellent example of a project that fully incorporates the policies and perspectives of sustainability/resilience nationally is the California High Speed Rail project, a project that WSP USA is supporting and just received a Platinum rating through Envision. This project can serve as a national example to other agencies working to make better decisions around infrastructure investing. Specifically, this project:

- Creates a rail/transportation system powered by electricity, generated primarily by renewable energy.
- Weaves consideration of effective use of natural resources into all policies – planning, design, construction, maintained, etc. – and has developed practices which analyze energy expenditures for the lifecycle of construction - from the extraction of base material (aggregate, etc.), to transport, to use in construction efforts.
- Considers future weather risks (wildfires, flooding and temperature) in design to ensure that the facility is built to withstand those events in the future and can be returned to service more efficiently.
- Better links the state's rural areas more effectively and efficiently to the state's economic engines through a faster and more efficient travel option, a capability that does not exist today.

Envision is just one such tool that we and others in the engineering and consulting business utilize. Regardless of which one is used, these types of sustainability and resilience tools allow our decisions to be more informed by future-focused science, demographics, socioeconomics, and best management practices – specifically including the risk-based frameworks that we have developed to not only plan and execute infrastructure projects

better, but also to pick the better projects to pursue. This "better" project selection should be based on a holistic, life-cycle, long-term impact perspective versus a short-term capital cost assessment. The first perspective specifically takes into account the negative impacts of emitted and embodied carbon as well as the positive physical and social benefits of climate adaptation and infrastructure resilience. Most of these decisions are currently driven by upfront costs, operational expediency, and worrying about the next quarterly report, election, or budgeting cycle. This in turn leads to a false narrative where infrastructure capital improvement budget-making is based on what money is available after "locked-in" operations and maintenance budget items are accounted for.

INCORPORATING EQUITY AND SOCIAL JUSTICE REALITIES

Equity and social justice, which have been increasingly highlighted over the past year, are critically important considerations from the sustainability perspective. In the context of a changing climate, studies have indicated that disasters and critical events disproportionally impact underserved and frontline populations – a notable ongoing example being the COVID-19 pandemic, which is underscored by our past experiences with extreme natural disasters such as major hurricanes, droughts and earthquakes. Frontline round-the-clock workers (including in essential transportation and infrastructure services) are disproportionately women, representing two-thirds of the frontline worker population, and minority populations, including Black, Hispanic, and Asian-American/Pacific Islanders.[2] Over the long term, climate change will thus affect some groups more than others. Transportation infrastructure, including how transportation is powered and where transportation and transit systems are accessible, underscore these challenges. Equity and improved economic opportunity need to be central tenants of Federal climate action, especially as it relates to transportation and infrastructure.

The current and future impacts of climate change, including sea level rise and other flood risk hazards, higher temperature, and wildfires have time-and-time-again placed an uneven burden on our less protected frontline

[2] A Basic Demographic Profile of Workers in Frontline Industries. April 2020. Center for Economic and Policy Research. https://cepr.net/wp-content/uploads/2020/04/2020-04-Frontline-Workers.pdf

communities – whether they be urban or rural. Further, each event comes with long-term economic and social costs. There are immediate effects to livelihood following events, such as disrupted and suspended transit service following Hurricane Sandy, limiting mobility for transit-dependent populations. There are also long-term effects due to these events, including social and financial insecurity for populations that were already socially vulnerable. Resilient infrastructure is at the heart of limiting the effects of these events and enabling agencies and communities to rebound more quickly to continue to provide needed services to their communities.

Amidst this social backdrop, climate change poses both an opportunity to expand upon the role of infrastructure to provide social benefits and opportunities for our communities and simultaneously poses a challenge to ensure that infrastructure is resilient to future conditions. In order to ensure that our communities are prosperous and equitable now and into the future, we need to expeditiously address both of these challenges. To inform Federal policies, frontline communities will need to be engaged where they are and truly listened to in order to gain their buy-in and achieve equitable outcomes. WSP works hand-in-hand with these communities and populations, working to hear and address their challenges at the local scale by providing the analytics and data needed to inform equitable decisions and the engineering solutions needed to holistically address climate change.

Especially as it relates to infrastructure and the built environment as it supports communities, we have an opportunity to make positive changes through an equity lens in helping people imagine and realize their own futures. In our business, we strive to create more dialogue, inclusion, and empowerment to increase trust in our work. WSP's own "walk the talk" performance measures provide an illustration of how this can be incorporated into the business ethic of a major company, which in many cases can also apply to governmental institutions and agencies. WSP USA's equity lens for our three key performance metrics specifically looks at:

1. Reduction in operational GHG emissions between 2018 and 2021
    a. Acknowledge the documented frequency and impacts of racism in America along with the disparate impacts of air quality and climate change issues.
    b. Engage and listen to communities and their accounts and experiences of inequity and harm caused by

environmental and racial injustices and group outcomes.

c. Provide feedback to stakeholders and focus on programmatic reform ideas.

d. Take action to address climate change with regard to equity, social justice, and economic outcomes.

2. The percentage of our services having a positive effect on the environment

   a. Develop a process to measure Green Revenue.

   b. Focus on how this impacts our shareholders, employees, partners, environments, and the communities we serve.

   c. Educate communities on implementing solutions to reduce energy use, water consumption, GHG emissions, supply chain disruptions, enhance Green Revenue, and to minimize impacts to underserved communities.

3. The percentage of women in management positions

   a. Ask all leaders to be role-models for our commitment to inclusion, diversity, equity, and social justice.

   b. Actively sponsor rising women.

   c. Ensure the infrastructure is in place to support a more inclusive and flexible workplace.

With this type of mindset, investment in transportation and infrastructure today has the potential to use our abundance of available data, best practices from across the globe, and American ingenuity to tailor technical solutions to the needs and priorities from constituents on the ground-level to ensure our most vulnerable realize benefits of infrastructure upgrades while society at large continues to benefit from the additional positive externalities from design excellence in infrastructure.

BETTER STRATEGIES FOR BOTH URBAN AND RURAL AREAS

Sustainability and resilience considerations make sense everywhere in the country – in urban and rural areas. Specific to rural communities, these practices make sense for all investments – particularly regarding resilience, where periods of loss of service can be devastating in these communities. There are plenty of examples

over the past years where impacts were very impactful in rural areas, including recent power loss in Texas and the Gulf Coast from both winter and coastal storm events, loss of water treatment facilities requiring residents to boil water throughout the southeast, and in road washouts and landslides in Vermont, North Carolina, Colorado, Michigan and Puerto Rico which severed access to communities for extended periods, or required lengthy and costly detours to reach services. Often recovery times in rural areas can be extended as the systems span larger geographies and resources may be limited. These past examples underscore the need to build more resilient systems to minimize potential weather-related impacts in rural as well as urban areas.

LEADING THE WAY THROUGH EXAMPLE AS AN INDUSTRY

The engineering community needs to lead, and has in many cases taken the lead, in changing the way we think about infrastructure investments and decisions. Of course, in the consulting industry, companies such as mine work with and on behalf of government and private sector clients. Many of these clients have made extraordinary commitments to address the cause of and respond to climate change. The field has been transforming itself over the past few years in ways that I personally have not seen before. Specifically, we have recently seen:

- Major companies take on the role of continually refining business operations so as to reduce the emissions impact of their operations, supply chains, and product life cycles while enhancing the resilience and equity of their business.
- Communities adopting policies that enable traditionally underrepresented communities to understand and develop strategies for targeted investments aimed at reducing climate change-related impacts on their citizens.
- Agencies overseeing major construction projects analyzing all of the processes and procedures from point of source origin to the point of construction and end of useful life to reduce to the extent possible GHG emissions.
- Government leaders (for example, in Hawaii, California, Colorado, Minnesota, New York, Michigan and

Massachusetts) among others requiring the consideration of future environmental conditions (not past conditions) as an element of major capital expenditures (in some cases, including such a consideration in State environmental laws).

- Ongoing dialogue among risk professionals who are starting to recognize that the unquantifiable factors of equity, environment quality, and community resilience need to carry a new, and heavier, weight in decision-making.
- Public bonding firms requiring a risk assessment on potential bond-funded actions as it relates to climate change.

RECOMMENDATIONS

Moving forward we have an opportunity to make further progress and take steps to ensure that the Nation's built environment and critical infrastructure is more resilient and secure as conditions continue to change. There are many recommendations for action that would help to secure a more adaptive future. Some of the more important ones include:

- Elevate climate change and extreme weather impacts on resilient infrastructure as a National concern. Federally-supported infrastructure programs such as that for transportation often include as an enabling statement that certain factors or issues are of National concern. For example, transportation legislation requires the consideration of numerous planning factors in the development of transportation plans, including transportation system resilience. All Federally-funded infrastructure programs should be reviewed from the perspective of how extreme weather and climate change considerations factor into planning and decision-making.
- Encourage and enable communities and agencies to define and quantify the risks they face with respect to climate change. It is critical that the technical approaches be available for making the case on the rationale for reducing GHG emissions and enhancing infrastructure resilience. This can only be done through

methods which include quantitative consideration of risks. One of the major advancements in engineering decision-making occurred decades ago when the U.S. Army Corps of Engineers developed a benefit/cost methodology in response to Federal water resources legislation. The benefit/cost methodology has been a mainstay of engineering analysis since. A similar introduction of risk-based assessment approaches is now warranted. This assessment needs to compare real dollar costs to associated weighted risks of future damages and loss of service from climate change and extreme weather.

- Include in this assessment approach the use of a life cycle perspective that considers all possible points of future failure. Unfortunately, this is very seldom considered in today's life cycle assessments. The assessment should recognize that some of the data and tools used today as part of engineering decision-making are very limited (such as 100-year flood plain maps).
- Support the consideration of equity and social justice in climate change and adaptation decisions. This should result in a shift from traditional measures of disproportionate impacts like those outlined in the National Environmental Policy Act (NEPA) to ones that instead seek to overcome inequities in the distribution of infrastructure benefits and negative environmental impacts (e.g., degraded air and water quality).
- Provide incentives (for example, grants or tax incentives) for incorporating future proofing actions and social equity into project designs. Such incentives could motivate innovation and creativity in the development of adaptation strategies. This would include the provision of funding as part of Federally-mandated planning processes to consider climate change as part of the planning process (for example, U.S. Code Title 23 for transportation planning).
- Encourage a multi-jurisdictional, multi-sectoral, and multi-disciplinary structure for assessing climate change-related risks among States and communities. Such a structure would facilitate efforts to combine the interests of communities, businesses, infrastructure and environmental stakeholder agencies who all recognize the concern, but have no guide for how to address policies that assume conditions will not

change. This would also include the dissemination and sharing of information on the institutional structures and program components that permit such collaboration.

- Adopt policies that encourage the rebuilding of extreme weather- or climate change-related failed or disrupted infrastructure that ensures the causes of such failures are understood and future protections are incorporated into new designs. Similar policies should continue to be adopted that reduce GHG emissions as our understanding of the contribution of such emissions to climate change and degraded air quality.
- Develop performance metrics that allow agencies to monitor changes in underlying conditions or contributing factors to climate change. The Federal government has encouraged the use of performance-based planning and programming for Federally-funded investments. Our experience is that traditional measures such as impact on road congestion or emissions have been the most-used metrics. Measures relating to the outcomes of public policies, for example, those relating to public health and system resilience, have in contrast been sparse. Illustrative measures for such types of outcomes should be developed and disseminated among the agencies responsible for infrastructure. This could include metrics relating to the social cost of carbon and the risks to infrastructure and communities resulting from a continuing growth in GHG emissions.
- Support research on the continuing and evolving science and technology phenomena that exacerbate climate change impacts or that conversely can help mitigate and/or adapt to such changes. Climate science has made major strides over the past decade as improved data and analysis techniques have provided the tools for advancing our understanding of climate/Earth relationships. By the very nature of the uncertainty associated with future environmental conditions, continuing to collect data and revise our understandings based on the new evidence will be fundamental to an effective National resilience and adaptation strategy.

CLOSING

As a company, WSP is committed to its responsibilities for helping to lead the way by reducing its own

emissions footprint and facilitating more resilient and sustainable infrastructure in a way that also advances equity. The clients we advise and serve have challenged us to develop and implement more future focused, sustainable and resilient strategies for them as well. This makes sense from a business perspective; from a good governance perspective; and from a sustainability perspective. I have no doubt that this is the future of infrastructure development in our Nation. National policies that encourage the development of this approach to infrastructure development would provide a catalyst for reaching this future sooner.

Thank you for the opportunity to provide you this testimony.