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U.S. House of Representatives Committee on Transportation & Infrastructure

Subcommittee on Water Resources and Environment

Hearing: The Water Resources Development Act of 2020 Status of Essential Provisions

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Full Testimony

Good day, and thank you Chairwoman Napolitano, Ranking member Rouzer, the committee, and staff. I appreciate the opportunity to share our experience with research and translating actionable information around flood resilience. I serve as the director of the Institute for the Environment at the University of North Carolina at Chapel Hill. Since 1795 Carolina has been committed to developing new knowledge to help our state and our country thrive, and flooding is certainly one of today's prominent challenges.

North Carolina is an excellent model system to consider the essential provisions of WRDA 2020. Our state has a fairly modest 322 miles of ocean coastline but a remarkable 12,009 miles of inland shoreline woven throughout the coastal plain. With two ports and a diverse water reliant economy, North Carolina has benefitted tremendously from the work of the Corps in our state. North Carolina has an impressive extent and diversity of coastal habitats that deliver value to both people and the natural system. Unfortunately, North Carolina has also had more experience than we'd like with hurricanes, having had 36 storms affect the state since the late 1990s. These storms present threats from wind, storm surge, and precipitation. In records kept since 1898, six of the seven biggest rain events in North Carolina have occurred in the past 20 years.

Our research team was established through two programs; the Creativity Hubs and the Collaboratory at UNC, both of which target investments in emerging research addressing grand societal challenges and build capacity for follow on work. The Creativity Hubs project is funded

through the university to encourage innovative academic partnerships. The Collaboratory funding is an example of the investment made by the North Carolina General Assembly to leverage the research expertise of the UNC system to provide the latest research findings and actionable solutions to state-policy makers. Recently, we received an additional 5-year grant from the Growing Convergent Research program at the National Science Foundation. We are grateful for the taxpayers' investments in our work and are enthusiastic about the contributions we can make to moving coastal communities forward.

Convergence research is an approach to formulate and apply research to tackle complex problems with societal relevance. It requires deep integration across disciplines and in many cases engages and integrates stakeholders and end users early and sustains their engagement throughout. It is clear that flooding is a transdisciplinary challenge and cannot be solved with individual expertise, but rather requires the integration of multiple concepts to develop new perspectives. Our team includes natural scientists, social scientists, and engineers who have the shared goal to provide new information to reduce damage from floods and storms, and as a result create economic, environmental and social benefits.

A focal area for our program, Wilmington is North Carolina's largest coastal city and port. This area relies on critical natural infrastructure in the form of wetlands and beaches and is also facing emerging challenges, such as harmful algal blooms. The region has an engaged citizenry and local governments working for environmental/economic balance and the inclusion of all communities in shaping and implementing resilience policy. Three features of our program have enhanced effectiveness and are relevant to key aspects of WRDA 2020. They include deep

engagement with stakeholders and end users, an emphasis on connections to financial risk and models, and heavy reliance on quantitative social science to frame our inquiries.

Efforts to answer complex questions related to population well-being and how to improve it in the context of shifting and uncertain environmental threats require engagement with stakeholders including state agencies, local governments, non-governmental organizations, and communities. Through a comprehensive effort at our program's inception, we developed a more robust set of project goals by incorporating the perspectives and experiences of the resilience community in North Carolina. As a result of this initial outreach and engagement, we strengthened our research plan and confirmed that we were developing solutions for high priority problems.

A large proportion of our program emphasizes explicit connections to financial considerations. Using coupled models which link environmental change to financial risk is a novel method to determine overall community risk from flooding. Quantifying the flood risk and losses associated with insurers, property owners, lenders, and local governments improves each group's understanding of its own risk, but also acts as a basis for developing more sophisticated strategies for managing risk. This type of highly resolved analysis is unique in that it characterizes risk at the individual property level for thousands of parcels within a community, which are then used to develop aggregate distributions of risk for the entire community, while also identifying the holders of this risk.

In addition to flood impacts on human populations and on communities, our program emphasizes effects on natural systems because of their important feedbacks to regional

economic activity and public health. Considering the ecosystem services, the monetary value of natural processes to people, we are able to connect to other financial analyses. We focus on three classes of benefits that natural ecological features can provide and that storms potentially disrupt. These benefit classes are maintenance of water quality, shoreline stabilization, and ecosystem sustenance. Components of ecosystems with the potential to provide these benefits include vegetation at land-water margins (forested wetlands and marshes), reef-forming bivalves (oysters, mussels), and submerged aquatic vegetation. An example from our work which has had significant application is the quantification of the economic value of nutrient removal by oyster reefs.

Looking first through the lens of quantitative social sciences we fuse engineering, natural and social sciences, and policy and planning to seek solutions to the challenges around flooding. To date, research in this realm has typically focused first on the natural portion of these coupled natural-human systems. Our process begins with quantitative inquiries of the human dimension, which results in reframed and refocused research approaches and decision-making and solutions more in tune with the needs of all communities.

How might our experiences as researchers be of value to this group in implementing WRDA 2020? From our perspective, here are three important steps:

- Include guidance to funding recipients regarding explicit consideration of connections to financial systems
- Conduct a comprehensive stakeholder engagement program, forming diverse teams with broad disciplinary perspectives; and

- Include quantitative social science as a key component of technical assessments.

In summary, embracing the interconnectedness and complexity of managing aquatic systems opens the door for solutions to a range of challenges. Consider a tidal marsh created through beneficial use of sediments. Evaluation of the dredging operation will have been improved by a clear vision of the beneficial fate of the sediment generated and the full suite of values delivered by the marsh. Sustaining the economy and the environment around quickly changing aquatic systems is a grand challenge, but it can be met, and it is clear that WRDA 2020 is poised to contribute to meeting this challenge.

Thank you.