Environmental and Energy Study Institute

Briefing Transcript

Nature-Based Resilience for Gulf Coast Communities

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Speakers:

Representative Charlie Crist (D-FL)

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Samantha Brooke, Coastal & Marine Team Lead, U.S. Fish and Wildlife Service

Rhonda Price, Deputy Director of the Office of Coastal Restoration and Resilience, Mississippi Department of Marine Resources; Mississippi Coastal Resilience Chair, Gulf of Mexico Alliance

Derek Brockbank, Executive Director, American Shore & Beach Preservation Association (ASBPA)

Moderator:

Ellen Vaughan, Policy Advisor, Resilience, Environmental and Energy Study Institute

Ellen Vaughan

Good afternoon everyone, and welcome to today's briefing on nature-based resilience for Gulf State communities. Thank you for joining us here on Capitol Hill, and those of you streaming online. I'm Ellen Vaughan, and I'm with the Environmental and Energy Study Institute. EESI is a bipartisan 501(c)3 not-for-profit organization, we're based here in DC, and we have been bringing fact-based, science-based information to the policy-making process for about 35 years now, through briefings like this, fact sheets and other activities. We're funded primarily by foundation grants and charitable contributions for which we are extremely grateful.

And I have the honor of introducing our expert panel who will discuss the extreme weather impacts specific to the five states along the U.S. Gulf Coast, and those are Florida, Alabama, Mississippi, Louisiana, and Texas, but they're also going to talk about the innovative, sustainable and hopeful solutions that are making shorelines and communities safer, more resilient, and better prepared for the next storm. So after we hear from the panel, and also in addition to our panel, we are thinking that we will be visited by Congressman Charlie Crist, so we'll just kind of pause and let him come to the podium when he arrives. So I will introduce the panel one by one and then after the panel we'll open it up to your questions, so if you can kind of keep note of those and keep those, we will have those at the end, and we usually try to leave you know 30 minutes or so if we can. So we'll go ahead and get the panel started. One thing I did want to mention is that we're also very delighted to work with so many wonderful offices here on Capitol Hill, I know Congressional staff are overwhelmed with so many issues, expanding portfolios, so we really appreciate your time and hope that we can be a resource to you.

So I would love to start by introducing Sarah Murdock. Sarah serves as the Director of U.S. Climate Resilience and Water Policy at The Nature Conservancy. Her 30-year career has spanned work in the public, private, and now nonprofit sector on environmental and energy policy. Currently, she manages the development and implementation of the Conservancy's climate, resilience, and water related policy positions with a focus on disaster risk policy. She holds a B.A. in Environmental Science from Colby College and an M.A. in Urban and Environmental Policy from Tufts University, and Sarah will give some context to this important issue today. Sarah, welcome.

Sarah Murdock

Thanks, Ellen, and thanks EESI for organizing this briefing. So I thought I'd start with just trying to give a little context and definition of what we talk about when we talk about natural infrastructure, or nature-based infrastructure. I like to start off by saying you know, when we talk about infrastructure, any type of infrastructure, we should be thinking of nature and all of nature's systems as a form of infrastructure. So when we're talking about making investments in infrastructure, we are really trying to educate folks as to the opportunities and the services that investments in nature, and the natural infrastructure provide. So that's kind of the big picture, obviously we're faced with tremendous threats from increased climate impacts, and those threats are in the form of increased flood events, increased extreme rain events, increased drought at the other end of the spectrum, increased wildfire, all of those increased threats. There is a role for conservation and restoration of nature as a form to reduce those threats, so I'm just going to walk through a couple examples of that.

So we think about it in kind of the coastal context, in the riverine context, and also in their urban context, so I'll start off in the urban. So in the urban context, a large growing threat are increased rain events causing urban flooding, both from storm water systems as well as just pooling and riverine kind of overflow from rivers and tributaries that run through urban areas. And certainly in that context there's a lot of great work going on to make investments in green infrastructure. So in the urban context we call it more green infrastructure. So things like greening bioswales, things along rivers, along street systems that absorb water, also using things like permeable pavement that absorb water instead of causing it to run off, green roofs, increase planting of trees, all of those things can help abate both the flooding as well as provide other co-benefits. And that's the thing about making investments in nature, we don't see just risk reduction from a primary threat like flooding, we see a suite of other benefits that come along with investment in nature. So we see things like cooling of cities through increased tree canopy, we see increased absorption of carbon from increased trees in urban areas.

In the riverine context we're really talking about ... I see the Congressman here, so I will pause for a second and yield the podium for a minute.

Vaughan

Thanks, Sarah, yes thank you. I'm delighted to welcome Congressman Charlie Crist, and we have been so appreciative of all his efforts on this issue, legislation reintroduced to create a state revolving loan fund to help fund mitigation so that we can be better prepared is just one thing, and we need these innovative financing mechanisms, and I want to thank you also for sponsoring our briefing today, and to Sarah Hansen for all her help, so I will welcome you here or wherever you want to be, thank you.

Rep. Charlie Crist

Thank you, Ellen, it's a pleasure to be here, and thank all of you for being here. Anybody here from Florida? Excellent, where? Nice, how about you? Pardon, Venice? Boca Raton, not Boca Grande? Well welcome, welcome all of you to the nation's capital, it's great to have you here and this is an issue that's near and dear to my heart. I live in St. Petersburg, Florida, which is on the west coast and I represent St. Petersburg and Clearwater and where I live is called Pinellas County. And Pinellas County is literally a peninsula, so coastal resiliency is pretty darn important to me. Florida is also a peninsula, so these kinds of issues have been rattling around my brain for a long time and very important to my fellow Floridians, but very important to our planet as you know.

And so the existence of rising sea levels is something that I have seen with my own eyes in my home state. In fact, I'm going to be in Miami, there's a little debate down there later this week and on Miami Beach there's a place called Alton Road, where literally when it's not raining, it floods. And I think it was President Obama who recognized this issue and said 'when it's not raining and it's flooding you got to realize the sea is rising.' And I think

most people appreciate that and it's really not a partisan issue, at least it shouldn't be. Look I used to be a Republican and I am now a Democrat, and I feel like that if you live near the coast anywhere, you're probably pretty aware that this is happening, and that this is real, and we need to pay attention to it and do everything that we possibly can to address it. And so that's why I'm privileged, Ellen, to be here in the United States Congress to help you and other organizations that are involved do everything that we can to address this issue, because it's coming at us, it's coming at us fast, and it's increasing in its intensity, and it's all related to climate change. And you know again being a Floridian we have these storms called hurricanes, and last year Hurricane Michael was coming up the Gulf Coast in the Gulf of Mexico, and by the time it approached the panhandle in Florida it had become a category 5 storm extremely quickly. And so that's another consequence of climate change and why we need to be as concerned as we are about coastal resilience as we are about the kind of storms that this thing creates.

So I want to thank you for being here, I want to thank you for being focused on this important issue. It's probably the most important issue we have, because if we don't have a planet, we don't have a future, and that's where this is. So God bless you, thank you for being here, and good luck to us all.

Vaughan

Thank you so much Congressman. We appreciate your efforts and we need all the help we can get on these issues. So Sarah, let me just invite you back up to the podium.

Murdock

So let me just finish up my broad definition of what we're talking about when we talk about natural infrastructure. So I talked about urban, and then I'm gonna talk about riverine context briefly. So in the riverine context we talked about natural infrastructure as mostly abating flood impacts. And in there, we're really talking about reconnecting river systems and reconnecting both the floodplains to river systems, and really allowing a more natural flow for rivers. So that takes various forms in river systems that we're talking about, things like setting back levees and restoring the floodplains connected to two rivers, we're talking about things like enlarging culvert sizes to allow for greater flow through those culverts, and also allow for better fish passage and better ecological connection of the river system, better sediment flow. And we're talking about things like removing dams in some cases where the dams are no longer serving any sort of function and are relics, and by taking out those dams we really are increasing the ecological health of the river and a lot of times reconnecting floodplains to those river systems.

And then finally in the coastal realm, there are, and we're going to hear probably more examples of this from our speakers, there are so many things we can do to increase the ecological health of our coastal systems that act as such an important buffer to increased threats that we're seeing from storms, from storm surge, from sea level rise, so everything from protecting barrier beach areas, restoring those areas, increasing dune systems. The Nature Conservancy is doing a lot of things like restoring and building oyster reefs as a forum for breaking wave energy and reducing storm threat in the Caribbean, and in the southern part of Florida, we're doing coral restoration. Coral reefs are shown to diminish wave energy by 95% when they're healthy, so we've done a lot of science work around that. So there's more work to be done in terms of measuring and monitoring the effectiveness of different ecological systems and their risk reduction value, we know a lot now but we definitely have more work to be done in that area.

And we also have more work and evidence to collect on the cost effectiveness. We know again some of the cost effectiveness and we've measured some of that. We did a study along the eastern seaboard post-Sandy that valued the wetlands in place during that storm. They abated $625 million in avoided damages to the structures and homes along that stretch where the kind of Virginia domain where that storms hit. So there's some good valuation, but there definitely needs to be more work done in that area as well.

And as I mentioned before, where the urban systems, when you're making these investments in natural systems, you're not just abating one threat but you're really bringing along a whole host of co-benefits, we call them, so water quality benefits, fishery habitat benefits, wildlife habitat benefits, recreational benefits, just community general aesthetic benefits. So all of these things are co-benefits, and natural infrastructure can also be thought of in conjunction with more traditional gray infrastructure as a way to green those systems as well, and sometimes make them more sustainable, and more resilient in the long run. So that's a general frame I wanted to

start off our discussion, and I think you're gonna hear some great place-based examples and if there's time I'm happy to chime in with a Gulf example as well later, so thank you.

Vaughan

Thanks so much Sarah for that good context. And so yes we are going to be looking at some place-based examples on the Gulf Coast. It's always helpful to sort of put these more abstract issues in something specific, but we also wanted to talk about how the federal government is supporting these efforts in partnerships and with resources, and so we were delighted to have Samantha Brooke from the U.S. Fish and Wildlife Service.

Samantha is the National Coastal and Marine Team Lead in the National Wildlife Refuge System. She hails from Midcoast, Maine, and has spent her career working at the state and federal level on coastal and marine conservation; on fisheries, bycatch, marine mammal recovery, habitat restoration, and Marine Protected Areas. So Samantha, welcome.

Samantha Brooke

Thank you for that welcome, and thank you to all of our audience members for joining me here today and for listening to a little bit about the Service's Coastal Program. I'm sure I don't have to tell all of you, but our coastal and Great Lake communities are incredibly important. Coastal areas are home to 30 percent of the U.S. population and are valuable economic drivers. One way or another, we're all connected to the coast, I'm sure most of you have some personal connection as well. You heard that I grew up in coastal Maine, so very near and dear to my heart.

Our coastal areas are also critical to the resources that the U.S. Fish and Wildlife Service cares about. I know most people are a little bit surprised when they hear U.S. Fish and Wildlife Service is working in the coastal environment, but in fact we have many different types of reasons to be there. 40 percent of the National Wildlife Refuges are located in coastal areas, we have 85 percent of migratory birds and waterfowl using that area, in addition there are migratory bird flyways that contact at least one flyway contacting every coast, and 45 percent of the threatened and endangered species that we manage are in coastal habitats. The Coastal Program is a nationwide, voluntary habitat restoration and protection program administered within the U.S. Fish and Wildlife Service. We work around the country in coastal watersheds on public and private lands, providing technical and financial assistance to protect intact habitats and to restore degraded habitats, increasing long-term coastal resilience. The program has been around since the mid 1980s and we've worked with over 6,000 partners from that time. We've restored over 1.5 million acres and we've leveraged $1.6 billion for conservation, that's $8 for every $1 that we put into a project. Many of our projects restore natural systems to provide those critical services such as wetlands for flood mitigation or mangroves to reduce the impact of waves, storm surge, and coastal erosion. These are the projects that we had the excellent introduction from Sarah talking about, and they do differ from that traditional or gray infrastructure, also called hard infrastructure that uses concrete or steel. There is a lot of terms for them, as Sarah mentioned green infrastructure, engineering with nature, or nature-based solutions, but regardless of what you call it, these types of projects are cost effective, flexible, and they have direct on-the-ground benefits for our businesses and our communities. And again, here you can see Sarah highlighted this study from Hurricane Sandy which demonstrated wetlands provided $625 million in direct property damage protection.

So I'm going to dive down to the Gulf of Mexico to coastal Texas, and I'm going to talk a little bit about one of those types of projects specifically that the Coastal Program is involved with. And I want to be clear that this is not a project that I've worked on directly, I'm very familiar with it but there's a large group of partners here that are invested in this place, which include private landowners, state, federal, and county staff, nonprofit organizations, and private landowners. So I'm gonna just do my best to represent the amazing work that's going on there. The Salt Bayou is the largest contiguous tidal marsh in Texas, it's 90,000 acres, and the image you see here, the orange line represents the Salt River and then the blue is the watershed area that we're talking about, the restoration projects occurring in. This ecosystem has been significantly impacted by humans, you can see ship channels, oil and gas facilities, and road construction, and these projects have been going on for some time. Historically, resource managers were pulled into the discussion with action agencies and through those consultations they began to realize that they lacked a shared vision for the future of the region which meant that they weren't providing a coordinated set of options for restoration. This led to internal discussion about the

overall goals for the Salt Bayou system. For example, there is excellent hunting and fishing in this area, as well as valuable commercial fisheries and a lot of tourism and bird-watching. And these different resource user groups were engaged in the conversation, but when you're restoring a place for bird habitat, your goals might be different than when you're restoring it for fish habitat, and so this was meeting that the folks weren't providing that nice consolidated set of opinions, even though they all agreed that saving the wetland was the most important thing.

So began a discussion about how they could work together, and during that time Hurricane Frances hit in about 1998, which resulted in significant fish kills and flooding. That really spurred a recognition among the partners that there was a connection between these various projects and the need to take a higher-level approach. So they really started to talk to one another about what was needed to make this system more resilient, began working on a higher level plan. There were still some folks who are a little bit not sure yet, they weren't fully on board, and then came Hurricane Ike in 2008, and this hurricane was devastating for the region that we're talking about. In fact, you can see in the lower right hand picture, this is the levee at Port Arthur and you can see here it's not quite over topped, it did get even higher than that, and in fact the floodgates weren't able to even fully close. And this was a game changer for the local community. I've just put some stats up here about the value of this area, it's incredibly important for the military, for oil and gas in the nation, it's a very important coastal water way, so clearly there were a lot of reasons that we all needed to be working together to protect these valuable infrastructure.

And that really provided the motivation that was necessary to finalize the restoration plan for the region. In 2013, the Salt Bayou Watershed Restoration Plan was completed, that took 15 years, nobody ever said that such a big thing would be easy, but the group came together. And the plan has four primary elements: the beneficial use of dredged material to restore elevation to the eroding marsh in the state wetland management area; increasing freshwater inputs by installing siphons across the gulf intracoastal waterway which would mimic those natural freshwater inflows; there was also a restoration of a historic beach ridge along the shore there to protect the marsh behind it; and finally improving the balance of saltwater at the Keith Lake fish pass. And I can report that there is a great deal of progress that has been made since that plan was finalized. Many, many partners came to the table to move the projects forward, and although work is ongoing we're getting some really positive results where these projects have been completed or partially completed.

In the top right hand corner we have the beneficial use project and working with industry on some state managed wetland areas, they completed one phase and in fact industry has come to the table again to put forward more beneficial use projects, and that picture there shows the area directly after the project was completed. It's all green now. The salt marshes come right back in, the vegetation. Then in the top left-hand corner we have the hydrological restoration, the modeling was done to take a look at what installing siphons in different areas would mean for the system, and that project is scheduled for construction to start in June. In the bottom right hand corner we've got the beach dune ridge restoration, the project was completed in a pilot phase for three miles and it was so successful that they were able to get the rest of the engineering and construction done, and they finalized it for the remaining 17 miles. That's expected to begin construction this fall or winter. And finally, the Keith Lake fish pass that was completed in 2015, and in fact data is demonstrating that it's working to better balance that influx of saltwater into the system.

So as I begin to wrap up I really want to emphasize that none of these large-scale projects can be completed alone. And the Fish and Wildlife Service and the Coastal Program is just one of many, many partners at the table, and I've listed a few partners here. And I would be remiss if I didn't acknowledge the efforts of two partners in particular, Jim Sutherland with Texas Parks & Wildlife, and Patrick Walther with the Service, and both of them actually passed away recently but were incredibly important, just key to moving these things forward and you can see that they came from very different perspectives and yet everybody at the table working together.

If you would like to learn more about this particular project, I'll draw your attention to a story on the Fish and Wildlife Services Nature's Good Neighbor webpage, this is about a judge, Jefferson County Judge Brannock, and he was very valuable in helping ensure that the county permits and different regulations and everything could help move these projects forward. So I really encourage you to check out this great story. I had a lot of fun visiting this area of the country and hearing from all the different partners. And lastly, just a plug for our Fish and Wildlife Service Coastal Program webpage and our Facebook page, so please feel free to check those out and I'll be happy to share with you more about these various projects, and projects in your areas if you're not from Texas, thank you.

Vaughan

Thank you, Samantha. As I said, hopeful. I think it's so great to hear these examples and that's just great news, so thank you so much. Next, I am very happy to introduce I think the person who traveled the furthest today, Rhonda Price from Mississippi. Rhonda is the Deputy Director of Coastal Restoration and Community Resilience for the Mississippi Department of Marine Services. And Rhonda's also the Coastal Resilience Team Lead for the Gulf of Mexico Alliance. In this role, she has helped to coordinate and enhance the efforts of state, local, federal, business, and nonprofit partners to assist coastal communities and ecosystems in the Gulf of Mexico region to become more resilient in structure and function. So the goals of the resilience team include increasing the Gulf region's understanding and localized risks associated with sea level rise, storm surge, subsidence, storm vulnerability, and other threats, also developing regional management tools to enhance resiliency through improved data, models, and methodologies, and implementing workshops to increase awareness and responsibility of individuals involved and emergency response at all levels. So Rhonda, thank you so much for being here, I know it was not an easy thing to find your way here but we appreciate your persistence.

Rhonda Price

Thank you, Ellen, yes it was a little bit of an adventure getting here but I'm here, and thank you for that lovely introduction and for approaching the Gulf of Mexico Alliance Resilience Team to come talk about resilience. It's something that is near and dear to my heart and I guess that's why I lead the resilience team, is because it took a lot of resilience to get here today.

Let's see, so I'm gonna start off with maybe some of you may or may not be familiar with the Gulf of Mexico Alliance, it is a regional partnership that was started in 2004 by the Governor of Florida, Jeb Bush, and he was looking for I guess partners from other governors and other states along the coast that were working on some of the same issues of concern that they wanted to address, dealing with ecological and economic health. At the time, they really didn't have anything to focus on until 2005 when Hurricane Katrina hit the Gulf, and there really gave the essence of an alliance. The thought was there that a regional partnership was needed, and really I guess timing is everything. So the Alliance was there, and when it was needed, that was when the structure of the Alliance took shape. So it is state led, and there are state representatives that, appointed by the governor, that make up for the Alliance Management Team. There is a headquarters with an Executive Director, and Laura Bowie is a force to be reckoned with, if you do not know her, Laura has really done an excellent job in keeping our teams focused and going in the right direction. There are six priority teams right now, we have a thousand active members, we have a Business Advisory Council with seven large industries in the Gulf, and right now we have 150 federal people that make up our federal advisory group, and we have a little over three thousand people on our GOMA email list.

So some of the roles that the Alliance plays, of course it is a partnership, so we believe in providing collaboration for those regional priority issues, developing tools and pilot projects for regional use, and then strategic partnerships that allow partner networking. How do we do it? Well after 2005, there was an action plan that was created in 2006, we are now in our action plan number three. So each of the teams will have various focus areas that they want to identify, and then actions that will take place underneath those focus areas, which are our goals. As I mentioned there are six priorities and we are the coastal resilience team. We do however pull from the other teams if we need any other information, like restoration or habitat, and education is also a great team as well. We have our Gulf Star partnership, and that is a funding source that allows projects to be funded through GOMA and it is used for fulfillment of our action plan that allows the teams to get on the ground and really solve some of the actions and priorities that they have within the plan. As you can see it's made up of state, federal, and lots of private funding as well. So by the numbers, so far we've had 2.3 million in project funding and a hundred percent goes to those projects, 45 projects and 131 institutions are participating.

So I am here to talk about resilience, and part of the resilience team is what are we about? So we try to look at regional response, and allow and assisting communities and states to become more resilient and respond better to natural and man-made hazards. And the way that we do that is through our assessments, communication, and planning and adaptation. So those are our three focus areas that allow us to focus on our goals and connecting those Gulf states. We work to increase awareness and knowledge of their tools and resources, promote understanding of those resources, and then the adaptation, mitigation, and restoration

strategies that help preserve our heritage along with our natural resources. Some of the accomplishments that the team has completed and is still ongoing over the last couple of years has been our Resilience Index. And that was a project by the Mississippi, Alabama, and Louisiana Sea Grant, the self-assessment that allows local decision-makers to go through six sections of looking at their critical infrastructure, transportation, business plans, and evaluating risk, whether they're weak or that hadn't even thought about it. So it allows the opportunity to sit down and have that conversation with those local municipalities, and even highlight in certain sections where the community rating system points could be identified and used later on. As a result of the success of that, we've created three more indices for tourism, fisheries, and the port. One of the small grant programs that have come out of the Gulf Star was working with Aransas Pass. They did the resilience index and realized that they had a weakness and wanted to develop a long-term plan to address coastal resilience. They conducted a community-wide outreach campaign, and right now they are there working on implementing that plan.

We also work in a lot of green infrastructure approaches as well, not just large landscapes but also in the communities. Some of that is working with our homeowners, so being part of the Department of Marine Resources we have a permitting office, and when homeowners are coming in looking at alternatives to hard structures like bulkheads, we really didn't have an answer for them and a lot of other states didn't either, come to find out. So with a partnership with Sea Grant and Mississippi State University Extension, they created a permitting guide and through the permitting guide allows homeowners to kind of do a checklist, is this living shoreline going to work for me? And if so, what are the cost-benefits and the permitting requirements that I have to go through in order to install a living shoreline. So there are several workshops and trainings that we have with homeowners. And another funding source that we received through the resilience community of practice created a green infrastructure working group. So they decided to go one step further and create five resource catalogs for each state, and those look at design and construction, some case studies, some pictures of before and after, and then just some fun facts about each of the states and the economic value that living shorelines could provide. So if you're looking for any more information there's GulfLivingShorelines.com, it is a wonderful resource guide not only for the homeowner, it also targets realtors, contractors, and developers and land use planners, so it includes everyone that is going to be vital in making decisions on constructing living shorelines. And as you can see, once again there's a lot of partners and collaboration that goes into creating those resource guides.

So another funding source that I just happened to be fortunate enough to work on was EPA Connecting the Dots, and that provided technical assistance to cities who in turn took the resilience index and identified some weaknesses. So part of this grant for Connecting the Dots was looking at community-specific vulnerabilities, and how to measure and mitigate those hazards and then creating that community dialogue. That's really important, is communicating that information back to the community. So the one that I'm going to focus on now is, or talk about is the living shoreline project in Biloxi, Mississippi. So a lot of cities are looking at alternative ways and wanting to kind of harden shorelines naturally and combat a lot of coastal erosion, so they are looking to a more natural alternative, and that is the living shorelines. So we had three demonstration projects that were going up, which in turn allowed the homeowners the opportunity to go in and see some of these demonstration projects. So it really wasn't planned, it just kind of happened that way, that we were working with the permitters, and creating training and workshops on how to get your permit, but then there was where can these homeowners see live, living shorelines and then learn about the application. So through Connecting the Dots, Stephen Dill, who is with the Mississippi Alabama Sea Grant, worked with the city of Biloxi in creating some of these kiosks that are going around to the three sites. And it not only lets you look at the living shoreline and the function, it gives you a little information about it as well, what is a living shoreline, what is the cost-benefit, and what are you looking at. And you can see at the bottom, there's once again lots of partners, we had our Secretary of State, The Nature Conservancy was involved, and this was the installation of the living shoreline at the old brick house, and it was used there to provide reduced wave energy to lessen the effects of erosion on shore.

Another project that was a community grant was to the city of Ocean Springs, and they wanted to install rain gardens. So it brought community involvement together that everyone got out, learned about rain gardens and the effects of it. Another one was the Harbor Infrastructure Adaptation Plan, so they had a coastal erosion problem around their harbor, and so they turned to a living shoreline application to reduce that coastal erosion. Another project that I fell in love with, Nicholas Satterfield with the New Orleans Redevelopment Authority spoke at our resilience team meeting in Austin in December. The resilience team has a meeting once a year outside of our yearly All Hands meeting, and he talked about the Community Adaptation Program, which was a grant that

was received to provide residents with residential stormwater management to improve their homes, and it was in the Gentilly Resilience District. And I loved the idea of a resilience district, so we have historical districts, we have business districts and now we have a resilience district and I think that's fabulous. Even in Alabama there is a whole fortified community so I could see that being a resilience district as well. But through the Community Adaptation Program they put together just identifying different things that homeowners could do, they could install rain gardens, detention basins, plant trees, and stormwater planter box, and then it gives you the level of labor, your rain capacity, and how much it's going to cost.

So I think I'm going to go back one because I want to make a point. And so we're looking at the homeowner and I think providing those community grants to homeowners to allow them the control, and once you've given them the tools to allow them to kind of make their property more sustainable, and in doing so the municipality becomes more sustainable. And once the municipality is more sustainable, then the state becomes more resilient, so it's kind of a pyramid effect. And having these community grants and the ability to reach and provide those funding opportunities to homeowners and to those local municipalities really makes a huge difference in creating more resilient states. And so another approach to shorelines that we look at is the more natural, larger landscape living shorelines, whether that be dune beaches, salt marshes, oysters or coral reefs that break those waves and the wave energies. One of the projects that were in Mississippi, so through the Gulf Regional Sediment Master Plan that was created through the GOMA's habitat team, Mississippi created the Master Plan for Beneficial Use of Dredged Material for coastal Mississippi, and that plan was used to provide the restoration of Round Island, which is now back to almost a historical footprint of a 200 acre island, and not only provides wonderful habitat, it also provides some sort of storm surge protection, just off the coast of what is Pascagoula. Another shoreline approach that we've been working on is the Hancock County marsh living shoreline, and that is a hybrid approach where we're putting oyster reef balls out in the front of the marsh to combat coastal erosion. So that is our hybrid of ten, it's almost six miles and 46 acres of marsh.

So part of all of this is our campaign awareness for 2020, and that is embracing the Gulf. So we are wanting to hold a gala in June to coincide with our All Hands, and we are expecting some of our keynotes to be those founding fathers of the Gulf of Mexico Alliance and that's Haley Barbour, Jeb Bush, and Rick Perry. So if you're in Biloxi or want to have an excuse to come to Biloxi and the Beau Rivage, please join us for the gala. Becky Ginn is the project corner of that and she is a rock star. And last but not least, we are working on authorization for our *Regional Ocean and Coastal Coordination Act*, which would designate ROPs, and NOAA as coordinators for federal and state authorities. We're looking to introduce that into the Senate this month, and we are looking for sponsors in the House right now. We have all five governors' offices that have signed on and we feel that the purpose of regional ocean partnerships, if you kind of haven't figured that out already, partnerships get a lot of work done and it enables us to receive that funding directly and get it down to the communities quickly. And so with that I will wrap up.

Vaughan

Great stuff, thank you so much Rhonda. And I am delighted to introduce our final speaker on the panel, Derek Brockbank is Executive Director of the American Shore and Beach Preservation Association. Derek is responsible for the growth, strategic planning, and government affairs goals of this organization, which is the nation's leading organization advocating for beach and coastal restoration. Derek has a background in climate and coastal conservation, and experience as a grassroots organizer, and he is getting ASBPA to lead coastal communities and decision-makers and the tough but necessary conversations about how they'll address sea level rise, increasing storm intensity, and other climate impacts. So we're really happy to have Derek with us today, thank you.

Derek Brockbank

Thank you, yeah I'm pleased to be batting cleanup I guess on this esteemed panel, so thank you to my previous panelists and the EESI for inviting me. My presentation today is gonna really be sort of two parts together. The first part is going to be talking about a more systemic issue and systemic solutions to nature-based resilience, particularly for shoreline and coastline management, so it's going to be looking at regional sediment management and beneficial use of dredge material. And then I'm going to pivot to what Congress can do about many of the things that we've heard here, so some of that will be about RSM and beneficial use, but some that'll

also just the general things that Congress can be working on, so hopefully you can take that back to your offices, some of your bosses and share those words.

So first off, ASBPA, we are an organization of coastal and beach practitioners, so we are the communities, the industry, and the academics that build, maintain, and manage our nation's beaches. So we include towns like Orange Beach, Alabama, and Galveston, Texas, so both big towns, small towns, as well as industry ranging from the big dredging companies to small little private environmental consultants. And we advocate for the restoration of beaches and coastlines for four interconnected values, I think you've probably heard them amongst the panel, but we define them as the protection benefit they provide, the ecological benefit they can provide, the recreation, and obviously when you think about beaches you think about recreation but there there are these other benefits, and then the economic value they provide to coastal communities. Very interconnected, but all very important to why we need to maintain healthy coastal systems.

Okay let's dig in. Sediment. What are we talking about, we're talking about dirt, we're talking about sand, we're talking about silts and clays, dirt and mud, and it really is the building block of a natural coastal system. So this is a shoreline in Galveston, Texas, that as you can see is badly in need of erosion, it's those properties are threatened by the next storm that comes along the Gulf of Mexico. So you could have put up a seawall, but we believe it's a better solution to actually rebuild that beach and dune system that both provides a layer of protection just as good as a seawall could provide, but it also provides habitat. This is a sea turtle habitat area, so you can have nesting sea turtles on that, obviously if you're beach homeowner or a hotel there, you'd rather have a beach in front of your house than the seawall, so there's a lot of benefits that it can provide, but really that takes sediment and we are facing a sediment crisis, a sediment shortage crisis on our shoreline. Sediment is just not readily available. This is a picture from the air from Louisiana, it's not just beaches that are eroding, it's our wetlands, too. Obviously if you've been to Louisiana, you know it's facing the greatest land loss in the country, one of the highest levels of land loss in the world. This used to be contiguous marsh and now it's open water because that sediment, well there's many reasons we can get into, but a big part of that is it’s eroding and the rebuilding part of that is not happening because there's just not enough sediment getting to coastal Louisiana.

So where has all the sediment gone, why is this a crisis? Well a couple things. Over the past hundred years we've channelized our rivers and bayous and tributaries, so we've both hardened the shorelines, so the eroding banks of a river which is the sediment that would eventually end up on our coast, the river banks are no longer eroding, we've got them concrete and cemented in, so you're not getting that sediment into the system. We've also channelized it. Bayous don't naturally run that straight, they meander, they weave, that creates a much slower system which allows sediment to accumulate in them. If you've channelized them, if you have them straight, they move fast and they carry a lot of sediment out deep into offshore. Someone mentioned, I think Sarah mentioned dam removal. We often think about dam removal for fish but there's a ton, literally tons and tons of sediment trapped behind dams, and that sediment is never gonna get to the coast. So if you’re coastal Louisiana and you want to see sediment rebuilding your marshes, that sediment is trapped up in Arkansas and Minnesota and all the way up into the Dakotas even. So you got sediment behind dams, and then of course to support navigation we've put jetties out to make sure that we can flush out that sentiment from the coastal system to go offshore to maintain navigation purposes, but that also means the sediment that would naturally be accumulating in shoals in waterways is not moving on the beach in a high flood tide, it's actually being pushed offshore. One more issue here, not for the Gulf Coast but in a cliff area, cliff faced beaches such as out in California, some areas in the Great Lakes, we've hardened cliffs, you build a home at the top of the cliff, you don't want your home to fall off the cliff, you harden that cliff. That eroding cliff is actually what builds the beaches in California, so they're seeing tremendous beach loss in California because that natural sediment is no longer there.

And then even once the sediment is available we're not using it beneficially, we're not putting it to good use. So obviously Louisiana you see we've pushed that, the bird's foot delta is really pretty much to the edge of the Outer Continental Shelf, so all that sediment that's being pushed out of the Mississippi is being wasted off the continental shelf even in high flood tides. When they open the Bonnet Carré spillway the sediment goes into Lake Pontchartrain, which is a fairly deep lake, it's not actually building in the sediment area, so we're not using sediment properly. So what's the solution? Well we need to manage our sediment reasonably and we need to beneficially use our dredge material. Dr. Houston, who is the former director of Army Corps’ ERDC, the engineering research development center in Vicksburg, has said shoreline recession is not natural but caused by human activity to benefit the navigation industry. Obviously, there's some caveats to that, some of it is natural but

it has certainly been exacerbated by navigation. I would also add to that, I think our system of flood protection, building up levee structures, hardening our shorelines has also exacerbated this too. But the point being you know, we've managed our river systems, we've managed our inlets, we've hardened our inlets, we're trying to get sediment out of that river and inlet system, and that means it's not going to the coast.

So this is causing that sediment crisis on the coast. This would be a problem no matter what was happening, but it's in the midst of exacerbating factors. Louisiana, or heck even right nearby in Hampton Roads, Virginia Beach area, we're seeing great levels of subsidence where the land is actually sinking. So if you've got an eroding coastline and you've got sinking land, it's bad news if you're trying not to get wet. Hardening shorelines, you put up a bulkhead and totally get it, you're a property owner, you buy a beachfront, waterfront home, and all the sudden the edge of your property going into the shore, you want to put a bulkhead to protect it. Well that's great but that actually exacerbates the land loss in front of it, even in a low energy system like here in Alabama. I think this is Gulfport Bay, I'm not sure but anyway it's gonna exacerbate that loss of sand in front of it. And then of course the big one which we heard about from Congressman Crist, sea level rise.

So all the things I'm gonna talk about today in terms of beneficial reuse, and in fact most of the policy things that I'm going to talk about, all things that should be happening irregardless of climate change, but climate change, subsidence, hardening of shorelines, all of these things make it that much more important. These are efforts that need to be done, but you're putting all these climate change's sort of the steroids of the coastal crisis. Okay, so it's already happening, I'm gonna run through this pretty quick. There's a lot happening, we've heard about it already, Samantha talked about the beneficial use project at Saltwater Bayou, that's how they're restoring that area. Rhonda mentioned I think a couple different beneficial use projects that they're working on through GOMA and certainly GOMA has been the driving force of regional sediment management in the region. But a couple things that I'd wanted to sort of flag. Louisiana has a State Coastal Master Plan, it's a comprehensive 50 billion dollar, 50-year plan. Part of that plan is a sediment management plan—how do we actually use the sediment that is in Louisiana, whether that's just offshore, whether that's in the wetlands, or whether that's coming out of the Mississippi River, how can we actually put it to good use? They're also proposing sediment diversions, which would be a sort of natural way of taking, or mimic a natural way of taking sediment out of the river and putting it into the wetlands. So you don't actually have to have mechanical dredges moving this sediment, you just open up essentially a controlled floodgate during times of high sediment, high water flow, and that'll pump sediment right out into the wetlands where it's needed as opposed to you know, Lake Pontchartrain or off the Outer Continental Shelf. Marsh creation projects, this is very specifically what's happening in Saltwater Bayou, what's happening in, well I guess in the Mississippi project, the one you mentioned there, it's actually building a barrier island, but you can just pump sediment. In Louisiana, they are pumping sediment over 20 miles from the Mississippi river into marsh creation areas where it's needed. So you can do it, the technology is there to move sediment a long, long way at affordable prices if the situation is dire enough.

So the other area which I don't think it's happened that much in the Gulf but it's starting to happen, this is actually I think a Nature Conservancy project in New Jersey, it's what they call thin layer placement. So rather than pumping in sediment to build up a brand-new marsh or turn open water into marsh, you're taking a potentially relatively healthy marsh and spreading out about a couple inches of sediment that's being dredged. It needs to be dredged anyway, but rather than sort of dumping it off the side of the dredge, you spray it out over the project and that helps the creep, that helps build the project up. So if you do this every couple years and put in two to three to five to eight inches of sediment, you can actually help marshes keep up with sea level rise doing it that way.

And then finally, the one that you know we obviously think most about as a beach organization is taking dredging from an inlet from a navigation channel and placing it on a beach. This is Babes Beach, it's a beach in Galveston, Texas, that won ASBPA's Best Restored Beach Award a couple years ago, and actually just this week or maybe was last week Galveston project, a Galveston district of the Corps announced they were going to be doing a new dredging cycle for the Galveston Ship Channel, and Babes Beach was going to be the recipient of that dredge, proud of that dredge material, so it's gonna continue to re-enrich that restored beach. So rather than just having the Galveston seawall, you actually have a beach in front of Galveston seawall. So again it's an economic generator, there's starting to be some wildlife habitat based on it, and then of course you know the beach is a much nicer recreation opportunity to see well.

So you got some good things happening already, we can go into this more in questions, I aligned a couple things that each of the five Gulf states are doing in terms of regional sediment management and beneficial use, again a big shout out to the Gulf of Mexico Alliance, their conservation habitat team has really pulled together the Gulf of Mexico Regional Sediment Management Plan, and that I believe has really driven a lot of the work that's going on in some of these other states. Another big piece of regional sediment management is the Corps, the Corps is the manager of our nation's water, our coastal systems and waterways, and is the one responsible for moving a lot of this dredge material. And here's where I think the Gulf is is actually pretty lucky in my opinion, I think three of the best Corps districts on regional sediment management are in the Gulf—Jacksonville, Mobile, and Galveston are all doing really good work, they're sort of thinking beyond the silos that is often set up from the Corps. If you're either in navigation or you're a coastal or you're a flood risk reduction, they're really looking at how they can blend budget lines, how they can think about project timing so that you know, if this beach needs some sediment maybe we can time the the dredging of the mediate adjacent channel to correspond with when we can actually place the sand on that beach. So you need to sort of think a little bit outside the box, and they're doing some good work there.

I mentioned ERDC, there's actually a regional sediment management program based out of ERDC, ERDC is in Vicksburg, Mississippi, it does service the nation but I think just the proximity to Vicksburg has helped some of these Corps districts be leading thinkers on RSM. There's also a number of studies going on right now on regional sediment management or that have regional sediment management as a major component to it. In the Gulf, that's the South Atlantic Coast Study which actually references the South Atlantic Division of the Corps, so as well as the South Atlantic Coast, it's also looking at the Gulf Coast of Florida as well as Alabama and Mississippi, and then there's a Texas coastal area study which is looking at how to manage sediment at a regional level in Texas. Then I already mentioned the Louisiana Coastal Master Plan which is run by the state, not the Corps, but you really have good comprehensive coastal studies going on throughout the coast. Engineering with nature, I'm not going to talk a lot about this but the Corps put out an atlas of projects across the nation, actually across the world, there's some US as well as internationally, they talk about how you're gonna do essentially nature-based resilience, looking at both natural solutions as well as resilient solutions, and then the section 1122 beneficial use of dredge material pilot program authorized in the last order.

Okay, I've spent way too much time talking on this, now I need to talk about what you can do. So this is going to be far quicker than it probably should be, but here are a couple things. I'm going to list all four different areas that can be supported, and for each I'm going to throw out two specific ways in which you can be helpful, so 4 times 2 that's 8 different ideas, there are probably dozens of things that you can be doing but these are just a couple.

First off, Army Corps. I said they managed the coasts, two things that I think they could be doing better and Congress can help in terms of oversight. One, change the understanding of the federal standards. So the federal standard says the Corps must dispose of dredge material as cheaply as possible so long as it's not causing any environmental problems. Which means it's often cheapest to dump dredge material offshore rather than beneficially use it, and that might be true in the short term, but I believe if you sort of think more big picture about what those costs are, the overall lifetime cost is going to be greater if you're dumping sediment offshore and then later on that beach or that coastal system, and then has to figure out a new place to get dredged material. So I think we don’t necessarily have to get rid of the federal standard, but I think we need to change the federal standard or change the understanding to incorporate the full lifetime cost of both the dredge project as well as the immediately adjacent potential restoration projects.

Secondly, I think we need to reform the benefit-cost ratio process that the Corps uses. Right now, the Corps authorizes projects based on a sort of essentially a single variable, so if you are a flood risk management project, all the benefits calculated are flood risk management benefits. If you're a navigation project, it's based on navigation benefits, which means projects that have multiple benefits, projects that may be flood risk management but also have pretty significant ancillary wildlife or habitat, or ecological values, those benefits aren't being calculated, and so you've got a levee that's going up in competition with a wetland, and maybe the levee provides better flood protection marginally, but the wetland is going to have tremendous other values in terms of ecological value, recreation value, so we need to think about the benefits more broadly. There was effort in the last order to address this, it ended up getting pushed to a National Academy study. I think we actually need to see the court reform this process.

Okay legislation, obviously there's *Water Resources Development Act* legislation that has a lot of stuff going in it, but two specific ones that I wanted to call out that are really good and are introduced in the house right now, the *Living Shorelines Act*, this would authorize a fund to be administered by NOAA that would support living shorelines projects, so it's essentially a grant program to fund living shorelines. Congressman Pallone introduced it, gosh about a month ago I think, but H.R. 3115, reach out to Pallone's office if you're interested. Second is the *Coastal Communities Adaptation Act*, this was introduced by representative Harley Rouda who's out of California, but was actually a little bit of the brainchild of Senator Nelson before he left office, and this would create essentially a sort of new revolving fund for communities to do coastal adaptation, sort of naturally-based coastal adaptation projects. So it'd be very little cost to the federal government but allow communities to have access to low interest or no interest loans. Two very good bills, you know if you're interested, reach out to the members to co-sponsor or learn more. Or just look them up.

Finally, or not finally, probably most importantly, the sustained federal investment. Obviously all these things all of us have been talking about take money. Local communities can support some of it, but the federal government needs to kick in, and this means passing appropriations bills on time. The three ones that I think are probably most relevant here are Energy and Water; Commerce, Justice, and Science; and Interior Environment, that covers Army Corps, covers NOAA, covers the suite of Interior agencies, including Samantha's agency, fund them on time, if they're not funded on time they spend a whole lot of money trying to figure out how to spend less money than what they have, so it's just a real waste to see these appropriations bills get delayed. And then we also need to fund coastal programs. I could take up ten slides to fund all of it to show you all the good programs that should be funded, but they're critical.

The second related piece of this is, we need to fund resilience before a storm. So much of the funding that we are getting right now from resilience comes post-storm. We've had the hurricane disaster supplementals, it's great to see the Congress step up and fund resilience, but that should be done before the storm, not after the storm. However, I will say until there is that political impetus to start funding these before the storm, the post-storm disaster recovery money is absolutely essential. That's how the Corps is doing much of their work, that's how efficient, we were just talking before the the panel about how Fish and Wildlife Service has what was it, $50 million or $40 million to do resilience work on its land, and that's money that wouldn't have been available except for post disaster recovery.

And then finally the big thing is how do these all work together? Natural-based resilience doesn't happen in a vacuum, we need to be supportive of all the other adjoining pieces of society really, and I think that starts with infrastructure. Congress has continued to talk about, the administration has continued to talk about a major infrastructure package. Our nation's coastlines are as much critical infrastructure as anything else, whether it's broadband, airports, shipping ports, roads; our nation's beaches, dunes, and wetlands are critical natural infrastructure that are providing the protection and the resilience to the rest of the nation's infrastructure. It's sort of the homeowners policy, you're not going to go out and get a new home if you don't get that protection, so you need to invest in natural infrastructure. I think it's also really important that natural or nature-based infrastructure is called out specifically in any infrastructure-like legislation. We're not talking about just seawalls and levee systems, we're talking about beaches, dunes, and wetlands and things like that. And then sort of finally after that we also need to think about how we're supporting the communities, because if we're not supporting the communities, there's not going to be the public need for these healthy coastlines. So when supporting the industry is like shipping, supporting ports, you know, full use of the harbor maintenance trust fund, supporting the fishing industry, we need to be making sure that Congress is supporting the communities that rely on these coastal systems, because it really is all integrated. If you let the shipping industry fall apart, the economy of certain towns could collapse, and then you don't have that drive for coastal restoration. So with that I will wrap up, I went really quickly there but I think we're happy to take questions.

Vaughan

Derek, thank you so much, that was wonderful to hear some of those legislative solutions that we might be able to take. And I might even add CBO scoring, it might be an issue to look at in terms of being able to account for these long-term benefits. So yeah, investing in mitigation is really essential. So I'd like to open it up to your questions, we have 15 minutes, anyone? Shy group. Oh, right here, sir.

Audience

You were talking about how a lot of this sediment is getting pushed farther out to sea because of these channels. I was wondering, is there a way to get that sediment back by dredging, or is it pushed too far? And if we can't, is it dangerous to keep taking sediment from inland, will that soon be pushed away as well?

Brockbank

Yes, great question. So yes, the sediment that gets dumped offshore, it depends, is the short answer. So if it's getting pushed out past the turn out or continental shelf, so the bird's foot delta of the mouth of the Mississippi River, you know as you can sort of see on that map extends way far out past the rest of Louisiana, and it's really close to that outer continental shelf where there's a big drop-off. So all of a sudden you're looking at you know 600-foot deep water to 6,000-foot deep water, and once it goes off that outer continental shelf it's essentially economically, I mean you can't get to it, it's just too deep. When it gets pushed offshore to the 600 foot water, yeah absolutely, and that's where some of the sort of mixed signals are getting, so if you're dredging and dumping it offshore you know, two years later they're literally going back and taking it from where you dumped it and putting it back on shore. So you've got an increased price but because you've missed time, then it's not happening.

And then your question to whether taking, allowing sediment from inshore, are you referring to sort of having it come down from rivers, like removing dams kind of thing? I mean there is always danger, sedimentation creates turbidity which is sediment in the water, and that can have impacts on certain sensitive ecosystems, so coral reefs you don't want a big sediment rich flow going into a coral reef system, because that could kill the coral, but in most I think for the Gulf Coast most of the Gulf Coast systems, you're not looking at that kind of sensitive [area], you're looking at marshes, subaqueous vegetation which can usually handle sediment flow into that area. I don't know, you might want to talk, there can be some issues with freshwater flow into oyster reefs, but you know historically there were always two reefs all over the Gulf Coast. So you know they might shift a little bit in placement, but you're still gonna have plenty of oysters on the Gulf Coast.

Vaughan

Yeah thank you for that question, there was one back there.

Audience

Can you discuss both benefits and possible disadvantages to dredging? Every session, it seems, in the Maryland General Assembly there are bills to permit dredging and it's very difficult to determine whether it's a beneficial option. How can we determine whether that's a good thing or a bad thing to do in the bay?

Brockbank

Guess some of it depends on what your values are. I mean, so what the purpose of the dredging is, I think one of the things that I was trying to make cases where there is dredging, that's when it needs to be used beneficially. So we're a beach organization and work on conservation, so I don't have a position on whether something should be dredged for navigation or not, maybe it should, maybe it shouldn't, that's not something I work on, but if you're gonna dredge for navigation, if you want to keep a channel or an inlet open so that ships can get in and out, and I'm not gonna take a position on whether you should or not, but if you're doing that, then you might as well make use of that sediment that is being picked up from the bottom of an inlet or the bottom of a riverbed and put it to a place that needs it like an eroding marsh or an eroding beach.

Vaughan

Any follow up?

Audience

It was one of the first slides that we looked at and it was very troubling to me in the sense that there were structures, houses that appeared on a downhill slope very close to the beach. Is that a good idea? And that it seems that if we were to determine whether we should do that today, assuming it's empty, should we be putting structures so close to the beach, and then on a downhill slope? Thank you.

Murdock

Yeah I think you raised a really good point that communities are becoming more and more aware of vulnerability and by doing things like vulnerability assessments, we're hoping the awareness is raised more of avoiding areas that we should further develop, and even there is more and more conversation about retreating from areas that we are have already developed. So it's becoming obvious that you know there's a lot of existing building and infrastructure and property that's going to be destroyed because of increasing coastal storms and impacts, so I don't see a near-term flip of people suddenly not wanting to develop along the coast or other risky areas, but I think we need to keep raising awareness about those increased risks.

Brockbank

I'll just add one thing than they can do, in the congressional solutions that we talked about, and the sort of integration of people and infrastructure and I think there needs to be additional funding so that communities that are repeatedly hit by flooding or repeatedly in harm's way, there's funding to buy out those houses. There are folks out there that don't want to stay. I mean you know, you hear all those stories of like oh they flooded 30 times and they're rebuilding, well you know what, chances are they probably don't want to rebuild but it's really challenging to get a buyout, even if there's money available it's challenging, and if there's no money available then you're basically asking people to throw away their life savings in their home to move. So I think that's another thing Congress can do is make that funding available, and also work with the various federal agencies to make it easier, particularly for you know, low-income, often less educated communities, often communities that have—to go in Louisiana, there's a strong Vietnamese population where language issues that are really challenging, you know, to make it easier for communities to understand what their options are to no longer reside in flood risk areas.

Vaughan

And to that point I'm glad that you mentioned that, because the House Financial Services Committee did report about National Flood Insurance Program reform and reauthorization bill and now looking for the Senate to take action, obviously for it to come to the floor in the house, but that's both an insurance program and a risk management program, risk mitigation, so I think that's something also keep in mind. David?

Audience

I may have missed it, but I don't think any speaker mentioned FEMA, and my question will be, there's talk about significant increase in pre-disaster mitigation funding from FEMA, do you see any of that funding somehow flowing into nature-based resilience?

Murdock

Thanks for that great question. So FEMA is a very important agency in this context, because a lot of funding Derek mentioned post-disaster, most of that's coming from FEMA, they have a lot of money that they invest in risk reduction mitigation through post-disaster, and often also through programs like the Flood Insurance Program. So right now, last year Congress reformed the *Stafford Act* and the pre-disaster mitigation program, creating this new program that's going to greatly increase the amount of funding available for pre-disaster mitigation which is great. So we're gonna see three, fourfold going from about 200 million to maybe even 800 to a billion dollars a year, which is great. The FEMA's right now has an open call for input on how they should structure that program, and one of the Nature Conservancy, and I know some other organizations that we work with, are going to be emphasizing the need to invest in natural infrastructure as part of that program. FEMA already does some of that, but I would say it's not prevalent use of a lot of their funds, but they have funded floodplain mitigation, they do buyouts, that's definitely a common use for some of their mitigation funds, but we do need to see greater investment and greater understanding of the role that natural infrastructure plays in that context.

Vaughan

Great question and thank you for raising the *Disaster Recovery Reform Act*, any other questions? Great.

Audience

Hi, you spoke to the effectiveness of nature-based solutions to storm buffering, can any of you speak to how we have to repair those ecosystems after a storm compared to hard or gray infrastructure? How do they hold up themselves?

Brooke

Sure. So we'd have done some preliminary monitoring, but the storms that have recently happened, it's sometimes difficult to do a very detailed monitoring project in a quick turnaround to get a very reliable scientific-type result. But many of the projects that were implemented in our Florida region for example, we did have several living shorelines that were impacted by the storms, in post storm it looked like they were still intact, and so just from a you know, a very preliminary assessment. So it seems like many of these types of projects do survive the storm. I know there has been a couple of studies on the post-hurricane impact in some other areas and comparing in particular hard infrastructure and the nature-based infrastructure in it, and it did seem that some of the nature-based infrastructure had survived more successfully and that there was, for example, behind some of the properties' bulkheads, the erosion had occurred behind it, which is the opposite of what you want, and that in similar types of areas where living shorelines had been implemented that hadn't occurred in the same way, so potentially that those having those bulkheads had we increase the potential for erosion, and there's a few studies on that, I'm happy to dig those out and send them to you if you're interested, but I don't know if you have anything to add there.

Murdock

No, just anecdotal, so nothing study-based just that natural systems tend to take a short-term hit but then come back in health pretty quickly, but it's really going to depend on the type of ecosystem and the geography but generally, there is a pretty strong regenerative process for natural systems and similarly have seen you know, you might take a little bit of degradation, it comes back pretty quickly versus when you compare to gray infrastructure, there tends to be erosion and scouring and undermining of those structures during their after storm events, so similar.

Vaughan

Derek sorry I just was curious if there was a mangrove study showing how at least the mangroves protected infrastructure?

Murdock

Yeah, I know we've done some work on that and I'm not up on what the results are, but I bet we did some photograph evidence of areas that were protected by mangroves, but yeah I think our gulf program has done some further study on that.

Brockbank

I was just gonna again sort of come back some policy prescriptions, two things. I put in a plug for engineers. You know, engineers design most hard structures, and engineers should be involved in designing risk reduction natural systems too, I think a lot of times, but if you want to if you want to have a distinct protection or risk reduction, you need to start including some of that engineering values, and we've been doing that on beach and dune systems probably more than any other natural coastal system because we've been doing it for 80 years. And then this sort of policy prescription of that is I would say I think this is a big need in this community, is to be able to have some standardized engineering guidelines and understanding of both the protection benefits as well as the regenerative benefits. I know the Army Corps of Engineers is working on that, I think Nature Conservancy is too, but I think I would hope that in the next five to ten years we'll have a much better answer to that question, rather than just anecdotal, we'll actually have some engineering specifications to say you know, this type of natural infrastructure can provide this much risk reduction, and can take this long to return, but we just don't have that yet.

Vaughan

Thank you. Any other questions? We are at 4:30, so how about if you have additional questions I think our speakers might be able to stay for a couple minutes afterwards. And I just want to thank our panel so much, please join me. And I want to thank all of you for coming today and also just a reminder on July 11th there will be an Energy Efficiency Renewable Energy Expo here in the Rayburn building in the foyer, so come on down, but thank you.

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