Committee Meeting

of

SENATE ENVIRONMENT AND ENERGY COMMITTEE

ASSEMBLY ENVIRONMENT, NATURAL RESOURCES, AND SOLID WASTE COMMITTEE

"The Committees will meet to take testimony from invited speakers on the topics of beach replenishment, climate resiliency along the State's coast, and the progress of the Department of Environmental Protection's Protecting Against Climate Threats (PACT) regulatory efforts"

LOCATION: Toms River Municipal Complex
Toms River, NJ

DATE: August 1, 2024
10:00 a.m.

MEMBERS OF COMMITTEE PRESENT:

Senator Bob Smith, Chair
Senator Linda R. Greenstein, Vice Chair
Senator John F. McKeon
Senator Latham Tiver

Assemblyman James J. Kennedy, Chair
Assemblywoman Alixon Collazos-Gill
Assemblyman Michael Inganamort
Assemblyman Gerry Scharfenberger

ALSO PRESENT:

Eric Hansen
Adaline Kaser
Office of Legislative Services
Committee Aides

Celia Smits
Senate Majority
Committee Aide

Matthew Martins
Senate Republican
Committee Aide

Elizabeth Theodore
Assembly Majority
Committee Aide

Brett Philip
Assembly Republican
Committee Aide

Meeting Recorded and Transcribed by
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Hearing Unit, State House Annex, PO 068, Trenton, New Jersey

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NEW JERSEY STATE LEGISLATURE

SENATE ENVIRONMENT AND ENERGY COMMITTEE

STATE HOUSE ANNEX • P.O. BOX 068 • TRENTON, NJ 08625-0068
www.njleg.state.nj.us

COMMITTEE NOTICE

TO: MEMBERS OF THE SENATE ENVIRONMENT AND ENERGY COMMITTEE

FROM: SENATOR BOB SMITH, CHAIRMAN

SUBJECT: **COMMITTEE MEETING - AUGUST 1, 2024**

The public may address comments and questions to Eric Hansen, Committee Aide, or make bill status and scheduling inquiries to Pamela Cocroft, Secretary, at (609)847-3855, fax (609)292-0561, or e-mail: OLSAideSEN@njleg.org. Written and electronic comments, questions and testimony submitted to the committee by the public, as well as recordings and transcripts, if any, of oral testimony, are government records and will be available to the public upon request.

The Senate Environment and Energy Committee and the Assembly Environment, Natural Resources, and Solid Waste Committee will meet jointly on Thursday, August 1, 2024 at 10:00 AM in the LMH Room, Toms River Municipal Complex, 33 Washington Street, Toms River, New Jersey.

The committees will meet to take testimony from invited speakers on the topics of beach replenishment, climate resiliency along the State's coast, and the progress of the Department of Environmental Protection's Protecting Against Climate Threats (PACT) regulatory efforts.

Issued 7/26/24

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COMMITTEE NOTICE

TO: MEMBERS OF THE ASSEMBLY ENVIRONMENT, NATURAL RESOURCES, AND SOLID WASTE COMMITTEE

FROM: ASSEMBLYMAN JAMES J. KENNEDY, CHAIR

SUBJECT: **COMMITTEE MEETING - AUGUST 1, 2024**

The public may address comments and questions to Adaline B. Kaser, Committee Aide, or make bill status and scheduling inquiries to Stephanie Cenneno, Secretary, at (609)847-3855, fax (609)292-0561, or e-mail: OLSAideAEN@njleg.org. Written and electronic comments, questions and testimony submitted to the committee by the public, as well as recordings and transcripts, if any, of oral testimony, are government records and will be available to the public upon request.

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SENATOR BOB SMITH (Chair): Hello? Is that audible?

It is. The mics are working.

Assemblyman Jim Kennedy is about 10 minutes away, but he called me and he said, "Why don't you get started?"

So, let's do that. We do want to hear your information and have time to think about it.

So, let me first introduce the members of the Senate Environment Committee who are present.

We have Vice Chair, Senator Linda Greenstein; we have Senator John McKeon from Essex County; and, we have Senator Latham Tiver -- and, Senator Tiver, what county are you from?

SENATOR TIVER: Burlington.

SENATOR SMITH: Burlington County--

SENATOR TIVER: Burlington, but I have four towns in Atlantic as well.

SENATOR SMITH: OK. You're a shore guy -- I'm making a note of that.

SENATOR TIVER: (laughter)

SENATOR SMITH: When Assemblyman Kennedy gets here, he'll introduce the Assembly members who are present at that time.

We have a pretty long list of witnesses today, and the thematic-- The thematic that we're talking about is what kind of trouble are we in; what can we expect to be happening, hopefully -- *not* hopefully -- in the near future; and, any ideas that people might have of things we should do to try and not get wiped out as a species.

So, that's the thematic. And, I would just point out while you're sitting here today, California is burning down. Last year, you had three weeks where it was really difficult to breathe in New Jersey from Canadian wildfires. We had hundreds of New Jersey citizens going to their local hospital because they had breathing difficulties. And, two years ago, we had 29 New Jersey citizens die--

ASSEMBLYWOMAN COLLAZOS-GILL: Sorry.

UNIDENTIFIED SPEAKER: Are you OK?

ASSEMBLYWOMAN COLLAZOS-GILL: I'm so sorry.

SENATOR SMITH: It's OK; it's called coming in with a--

ASSEMBLYWOMAN COLLAZOS-GILL: I was trying to--

UNIDENTIFIED SPEAKER: (indiscernible)

ASSEMBLYWOMAN COLLAZOS-GILL: I was trying to be discreet.

(laughter)

ASSEMBLYWOMAN COLLAZOS-GILL: I'm so sorry; I apologize.

SENATOR SMITH: It's OK, it breaks up some of the really down things that I'm saying.

So, anyway, we had 29 citizens die because 9 inches of rain fell in places in New Jersey where they've never had that kind of rainfall.

So, the question is, how bad is it going to be? When is it going to happen? And, what should we be doing about it?

Our first witness is from the DEP, Nick Angarone -- Nick, are you here?

Nick, we need you up here.

And, in addition to telling the answers to all these questions, you've got to tell us about the new PACT -- P-A-C-T -- rules, and what they mean for New Jersey as well.

So, Nick-- Nick, by the way, is the Chief Resilience Officer and Manager of the DEP's Office of Climate Resilience.

N I C K A N G A R O N E: Good morning; everybody hear me?

SENATOR SMITH: I don't know. Move the microphone close.

MR. ANGARONE: How about now?

SENATOR SMITH: I don't know -- can -- are we all -- is the microphone good for the--

MR. ANGARONE: Can you hear me?

SENATOR SMITH: Have that real close and speak to it.

MR. ANGARONE: Think we're good here?

UNIDENTIFIED SPEAKER: I can hear it.

MR. ANGARONE: All right; excellent.

SENATOR SMITH: OK--

MR. ANGARONE: Good morning; thank you for having me.

I'm Nick Angarone, New Jersey's Chief Resilience Officer, Manager of the Office of Climate Resilience, at the Department of Environmental Protection, and New Jersey's Coastal Manager.

Commissioner LaTourette couldn't join us today, but he sends his regards. If he were here, he would remind us all to be clear-eyed about what is happening right before us; that we can't look away; that climate change is real; it is here; it is now.

The Office of Climate Resilience at DEP works at the State and local level to prepare our communities, infrastructure, and natural

environments, for the current and future impacts of climate change. That office encompasses the Blue Acres program; New Jersey's Coastal Management Program; and Resilient NJ, the State's premier local planning assistance program. My office also staffs the New Jersey Interagency Council on Climate Resilience, which, as New Jersey's Chief Resilience Officer, I serve as Vice Chair.

The Interagency Council is made up of 26 State agencies and departments, with the goal of coordinating and promoting climate resilience across State government. In the last few years, the Interagency Council has developed and released the Statewide Climate Change Resilience Strategy, and, just a few weeks ago, an Extreme Heat Resilience Action Plan. These documents lay out specific strategies and actions, detailing State agency action on climate resilience.

As the Senator was referring, the past few years have demonstrated the critical need for this work. So far, 2024 has been a year marked by the world's hottest day in recorded history; the first category 4 hurricane to ever form in the Atlantic during the month of June; and a National Weather Service Prediction of 17 to 25 named storms this hurricane season.

2023 was the hottest year on record since we began tracking in 1850, and 2024 is well on its way to surpassing *that*. We just came through the hottest June ever and have had 12 straight months of record high temperatures. The ocean has now broken temperature records for more than a year. This past December, and then again in January, rains deluged communities in Northern New Jersey at the same time that we experienced a continued year-over-year snow drought.

2022 brought us a drought watch for most of the year, and some of the largest New Jersey wildfires in nearly a decade. We had a 9-mile-long harmful algal bloom that plagued the Millstone River, endangering a critical drinking water supply serving 800,000 users in Central Jersey.

And, we cannot forget the devastation caused by the remnants of Tropic Storm Ida in September in 2021, which decimated many inland areas and took the lives of 30 of our neighbors.

These alarming conditions are precisely what climate scientists have been projecting and warning policymakers about for years. New Jersey's changing climate is forcing residents and businesses to grapple with a world of worsening extremes. Amid these climate realities, we would be wise to reflect on the fact that, as of 2019, New Jersey ranked third in the nation in claims paid by FEMA since 1978.

SENATOR SMITH: Third in the nation in what?

MR. ANGARONE: Third in the nation in claims paid by FEMA since 1978, with $5.8 billion in total flood insurance claims.

However, flood risk extends beyond the boundaries mapped by FEMA, with over 30% of claims from Ida originating outside of FEMA's designated flood plains.

We are not yet ready for this new world. But, empowered by sound science and a willingness to make informed, wise changes, we can help our communities, residents, and businesses become more resilient to the continuing climate changes that lie ahead. We are on our way to such changes in New Jersey, through multiple climate resilience efforts, including regulatory reforms.

Last year, DEP adopted the Inland Flood Protection Rule, an amendment to the State's flood rules based on more recent analyses of New Jersey-specific rainfall, confirming that annual and extreme precipitation is increasing across the state, and will continue to increase throughout the end of the century. The inland flood protection rules ensures that these realities are properly accounted for in building and stormwater design standards for new development. This approach not only makes New Jersey a clear leader in climate resilience policy, but a safe bet for continued investment and growth.

Where New Jersey leads, the nation follows. We updated our precipitation data, and now there's a Federal move afoot to do the same. And, we are continuing to lead, taking deliberate action to ensure the climate risks are better understood and reduced, by updating environmental land-use regulations in our coastal communities, under a reform known as Resilient Environments and Landscapes -- or REAL -- a component of the New Jersey Protecting Against Climate Threats -- NJ PACT -- initiative.

Like the Inland Flood Protection Rule, which corrected for obsolete precipitation data in riverine areas, REAL will correct for the fact that our coastal zone management rules do not account for sea-level rise. Without these amendments, the reconstruction of storm-damaged buildings and infrastructure, as well as new investments in private and public assets, would be constructed to outdated standards that will only become more so as flood risks continue to worsen. This would leave New Jersey communities vulnerable to harm and new investments subject to continued, repetitive loss.

And, like New Jersey's increasing risk of extreme precipitation, sea-levels are increasing at a greater rate in New Jersey than in most parts of

the world. It is likely that sea-level rise will meet or exceed 2.1 feet by 2050, as the Senator's map shows us on the left--

SENATOR SMITH: Yes, by the way, that's NOAA's map--

MR. ANGARONE: NOAA's map, on the left--

SENATOR SMITH: National Oceanographic Agency--

MR. ANGARONE: And, 5.1 feet by the end of the century.

Sunny-day flooding will occur more often across the entire coastal zone, with a 50% chance that Atlantic City will experience flooding almost every day by 2100.

By requiring that current and future flood risks are taken into consideration in development and re-development projects going forward, the REAL rule proposal will bring us one step closer to escaping the endless cycle of disaster, rebuild, repeat.

SENATOR SMITH: So, in a nutshell, what the REAL rules -- the R-E-A-L rules -- what-- Can you do a 30-second summary on what it does, what it says to people?

MR. ANGARONE: The two primary aspects of the regs that I will point out to you are that we are incorporating sea-level rise into the elevations that buildings, development, and re-development must consider in their permitting.

So, whereas in the past you have based that on the FEMA 1% storm, we are now basing that on a climate-adjusted flood elevation, which is the FEMA 1% storm on top of 5-feet sea-level rise. It also--

SENATOR SMITH: On top of what?

MR. ANGARONE: Five feet of sea-level rise.

SENATOR SMITH: OK, so 5 feet is baked in?

MR. ANGARONE: Five feet is baked in; that's what we are-- That is the projection for-- That is the likely projection through the end of 2100.

SENATOR SMITH: OK.

MR. ANGARONE: The second piece that I will identify for you is the inundation risk zone. And, these are areas that will be inundated, again, by 5 feet of sea-level rise by the end of the century, in and of themselves, simply from sea-level rise. And, in those cases, development and re-development in those areas will be asked to do some additional level of vulnerability and risk assessment, and recognize the forthcoming flooding. Those are the two primary aspects that I--

SENATOR SMITH: So, one question on that.

God forbid we have another Sandy. What stand-- Would people be able to rebuild their homes, or, on the -- I'm sorry -- would they be able to rebuild their homes, and would the new rules apply to the rebuild?

MR. ANGARONE: There are new-- There are requirements for re-development within the regs. If they were-- But, yes, they will be able to rebuild their homes.

SENATOR SMITH: But, will the new rules apply such, for example, that you have to raise it up 8 feet?

MR. ANGARONE: To be frank, I am not the implementor of the rules, and so--

SENATOR SMITH: So, you're not sure--

MR. ANGARONE: --and, so, the details -- the many details of those regs -- I couldn't speak to you in detail about.

SENATOR SMITH: And, just while you're turning the page, that is from the National Oceanographic Agency. That's their best guess on what happens to Jersey if we have a 2-foot rise, which, Nick, I think you're saying is baked in by 2050.

MR. ANGARONE: Right. New Jersey State projections, based out of science that's coming out of Rutgers University, tells us that we should -- are likely to see 2.1 feet of sea-level rise by 2050. And, for all intents and purposes, we are baked in to that amount because of past greenhouse gas emissions.

SENATOR SMITH: So, if you live down the shore, you want to take a real close look at that exhibit.

Nick, I'm sorry I interrupted you.

MR. ANGARONE: Thank you.

The Department has been working on these rules for four years, and we appreciate the discussions with stakeholders that have informed development of the proposal, and we look forward to receiving and evaluating further input during the public comment period.

My office is all too familiar with the long and difficult road that comes with disaster recovery and rebuilding. Now three years out, our Blue Acres staff continues to work with homeowners impacted by Ida. Since the storm, we've received over 630 applications from individual homeowners. Of those, we've been able to secure funding for over 230 properties and closed on 59 homes this year.

SENATOR SMITH: So, you're talking about buyouts?

MR. ANGARONE: Yes, buyouts; Blue Acres program.

SENATOR SMITH: One question on the buyouts: Are they getting paid fair market value, or are they getting paid the value of a home that's in a major flood area?

MR. ANGARONE: We now look at the value of the county where they are located. So, recognizing that the kind of market across the state differs somewhat geographically. We do look at the broader county market, and, yes, they get fair market value starting at that scale.

SENATOR SMITH: OK, thank you.

MR. ANGARONE: So, Blue Acres is funded primarily by Federal resources, and the lengthy Federal funds process draws out the buyout timeline, and makes an already difficult decision even tougher for homeowners.

Support for State-funded buyouts has allowed us to move much more quickly on some of the most seriously damaged homes. It is our hope that the new law on flood-risk notification will reduce the number of homeowners who are unknowingly in harm's way.

SENATOR SMITH: Right, and, just to stop there -- not everybody may be aware of the legislation, even though you voted for it, because it's now the law in New Jersey.

But, when you are selling a house in New Jersey, you, as the seller, have a legal obligation to reveal the flood history of the property, so that the buyer knows what they're getting. And, DEP, I believe, is supposed to put a website up where you, as the potential buyer, can go to that website and evaluate what you think DEP's risk assessment is for your area, correct?

MR. ANGARONE: So, yes. So, the Flood Disclosure Law requires three State agencies to act. DEP was required to provide an online

mapping tool where you can enter in your address and understand whether you are in the FEMA-designated 100-year or 500-year flood plain. That website is up and operational, *flooddisclosure.nj.gov*. Our Department of Community Affairs and Division of Consumer Affairs have also updated their forms that go into both the real property sale and rental processes. So, all of that information is up, and is available--

SENATOR SMITH: Yes, and I believe it also has to be on the real estate contract as well.

MR. ANGARONE: Yes. Yes.

Unfortunately, as we are seeing today, flooding is not the only climate impact we're dealing with. New Jersey is the third-fastest warming state in the nation, making extreme heat a growing and imminent threat to public health and safety.

Just a few weeks ago, on the tail of yet another heat wave this summer, New Jersey's Interagency Council on Climate Resilience released the Extreme Heat Resilience Action Plan -- just the third of its kind in the nation. The plan sets forth 135 specific actions that state agencies will take to mitigate the impacts of extreme heat, and includes recommendations for Legislative action related to cooling centers and worker safety.

As Vice Chair of the Interagency Council, I am extremely grateful to my State agency partners who understand the urgency of the issue and who are committed to facing it together. But, we must acknowledge that State-level action can only go so far; we need action at the local level, too, and it's our responsibility to support that work as best we can.

I often say that resilient communities will result in a resilient state. And, so, much of my office's work is providing direct assistance to

municipalities; helping them use the best available climate science to assess their vulnerabilities; develop and implement plans and projects to protect them. We do this primarily through our Resilient NJ Planning and Technical Assistance Program, where we have worked with over 40 municipalities with additional opportunities coming in 2025.

Those plans have directly resulted in over $23 million in additional Federal funding benefiting participating communities so far. These funding successes include, for example, a resilience hub in Newark Ironbound; pump stations in multiple communities; a new resilience park; and the resources for the design of additional projects identified through the Resilient NJ Program. We have found time and again that good planning begets funding. The success of Resilient NJ and resilient initiatives across are supported by the Coastal Management Program; have been recognized at the Federal level; and resulted in additional multiple awards that allow us to build upon that work.

Just last week in Perth Amboy, the Coastal Management Program was awarded over $72 million through NOAA's Climate Resilience Regional Challenge to launch Building a Climate-Ready NJ, the largest and most transformative climate-resilience initiative we have undertaken to date. Building a Climate-Ready NJ is a collaborative effort, with 15 New Jersey-based academic institutions and NGOs -- a few of them who are also testifying today -- to implement a suite of projects that increase community and ecological resilience; make climate-resilience planning accessible to a greater number of communities; and support them move those plans to implementation with comprehensive technical assistance, robust education, outreach, and engagement.

We must also acknowledge that climate change is not limited to the coast, even though many of our State-level funding sources for resilience limit us to the coastal zone. According to a recent New Jersey-specific report by Rebuild by Design, called the Atlas of Disaster, every single county in New Jersey has had at least five major climate disasters between 2011 and 2021. Morris County had nine -- the most in the state. And, I'll remind you that these are only Federally declared disasters, not the increasingly frequent events that pummel our communities, that aren't extensive enough to garner a Federal declaration, but which result in major impacts all the same, such as those that occurred in Passaic Basin this past December and January, and those that repeatedly occur around the Rancocas Creek in Burlington County.

And, while the Federal Government is making great investments in climate resilience, their programs are typically competitive and require significant resources to even apply, making it even more difficult for our disadvantaged and over-burdened communities to access those funds. And, as the number of billion-dollar disasters continues to increase across the nation, these funds are already stretched thin.

The good news is that New Jersey's communities are ready to be resilient, and ready to invest in their future. Almost every week, I meet with communities who are desperately searching for solutions to climate impacts they are already experiencing. We hear about their challenges and their needs; we steer them towards potential resources such as Federal grants; but, we know that, for some, even those opportunities are out of reach because of a lack of local capacity. Wherever we can, we offer technical assistance.

We are proud of what we have accomplished so far, and all of the work we do to support New Jersey's communities. We have seen that it makes those communities successful at earning limited Federal dollars; we also know that there is much, much more work to be done if we are to help our communities grow and thrive in this changing climate.

Thank you very much for the time today. I look forward to answering any questions.

SENATOR SMITH: So, sit--

MR. ANGARONE: Yes, sir--

SENATOR SMITH: --and, the questions-- Assemblyman Jim Kennedy, the Chairman of the Assembly Solid Waste and Environment Committee is present.

And, I did not introduce your members, because only you know them as well as you do.

ASSEMBLYMAN JAMES J. KENNEDY (Chair): Let's not bet on that.

(laughter)

ASSEMBLYMAN KENNEDY: I think I'll have them introduce themselves.

SENATOR SMITH: OK.

ASSEMBLYWOMAN COLLAZOS-GILL: I am Alixon Collazos-Gill; I am from the 27th Legislative District, which includes Montclair and the northern part of New Jersey.

Thank you.

ASSEMBLYMAN SCHARFENBERGER: Hi, everybody, I'm Gerry Scharfenberger; I am the Assemblyman from Legislative District 13,

which is all in Monmouth County, and has a big shore section. So, there's a lot of relevant discussion here for my district.

Thank you.

ASSEMBLYMAN INGANAMORT: Thank you, Chairman.

Good morning, I am Assemblyman Mike Inganamort, from the 24th Legislative District, covering Morris, Sussex, and Warren counties.

We primarily swim in lakes, ponds, and rivers, but the shore, of course, is important to all of us, so, privilege to be here.

Thank you.

ASSEMBLYMAN KENNEDY: And, I am Jim Kennedy.

This is like Yogi Berra said, "Déjà vu all over again."

In 1953, I was born and my parents moved from Norfolk, Virginia, to a street called River Road -- aptly named -- with seven kids in their family.

After -- I remember my father saying -- there was a guy who was in the Navy for 23 years and saw a lot of water, a Pearl Harbor survivor. And, we used to get about 3 feet of water in our bedroom in the first floor on River Road. So, I can remember growing up, my father complaining about overdevelopment on Route 22. He said, "They paved all those damned parking lots, and now it's in our basement."

And, so, I'm well aware of the issue, and looking forward to hearing from everyone.

Thank you.

SENATOR SMITH: Thank you, Chairman.

One thing for staff -- and, you know where Nick lives -- you said that you have a report that has some Legislative ideas that we should be

looking at. Maybe we can get that and share it with everybody, because hopefully some of the members on the Assembly and Senate side will be participating in that and hopefully getting some legislation that you need.

I'm going to open up to questions from anyone for Mr. Angarone, but one question: In your opinion *and* the Commissioner's opinion -- because it's got to be the same opinion -- what's the single best thing we should be doing to try and mitigate global climate change in New Jersey?

MR. ANGARONE: So, if we're talking about kind of how we address the impacts of climate change and climate resilience -- which is where -- what I work on every day -- the short answer is it's an all-of-the-above approach.

SENATOR SMITH: It's the coward's way out.

(laughter)

MR. ANGARONE: But, what -- in my opinion -- what we need to do is provide significant support to our 564 municipalities who are desperately searching for the resources to help them take those actions. We have the tools, the guidance, the plans in place to help them take that action, but we are all struggling to kind of compete over the limited Federal resources that are currently available.

SENATOR SMITH: So, I'm an interpreter in my side life. What you're saying is we need to be devoting money so that we can take advantage of other programs?

MR. ANGARONE: Has anyone up here ever suggested -- told you they didn't need any more money?

SENATOR SMITH: I've never heard that testimony before.

MR. ANGARONE: Yes, I mean, look, unequivocally, there is a significant need in the State for resources at multiple levels for multiple purposes.

SENATOR SMITH: So, even though I wasn't supposed to have the second question, it's a request: How about you and the Commissioner send us a memo on what you think needs to be funded in what time frame, so that we, as Legislators, can see if we can be helpful?

MR. ANGARONE: I will certainly express that request to (indiscernible)

SENATOR SMITH: OK, Mr. Angarone is available for questions.

Anybody have any questions?

Senator McKeon.

SENATOR McKEON: Yes, sure; thank you.

And, interestingly enough, the issue -- the State of Vermont has something similar to an NRD program, but related to holding the fossil fuel companies responsible to the extent of funding resiliency projects.

So, it's something I'm certainly interested in, and I hope you are, Senator, along with the rest of the Committee as one particular source.

SENATOR SMITH: I think you have a good bill, too, right? And, I've already begged to be a co-prime sponsor.

(laughter)

SENATOR McKEON: Together, so.

It's the John and Bob show again.

But, on a serious note -- and, that was serious, as it relates to funding. All the projects you mentioned are amazing; the work that's fostered

by you and your agency. I look at the City of Hoboken and just marvel as it relates to how well they've done over the last five, six years, in changing a little rainstorm to puddles everywhere to doing the right things to improve the quality of life of the people there.

But, from 30,000 feet, as the great Senator has referenced, and often does -- and, you should hear him in caucus, when you call yourself Cassandra. I don't want to be Cassandra, but just continuing to beat the drum. I mean, these statistics are just astounding, as it relates to what we're faced with. And, other than a straight-out climate denier, I mean, we're here.

But, the Governor -- because of the need to move immediately -- the Governor in 2020 went forward with an Executive Order I think that set forth maybe 22 different categories of challenge to DEP to put into play to come in conformance with PACT. I think today, in 2024, maybe eight of them have been met.

So, as much as I respect the administration and their efforts better than any like administration ever in New Jersey -- and probably when measured against the rest of the country, leaders -- we have a long way to go.

MR. ANGARONE: We absolutely do. On -- Senator, I believe you're referring to Executive Order 100--

SENATOR McKEON: Yes--

MR. ANGARONE: --which directed DEP to develop and implement regulations across both the greenhouse-gas mitigation side, as well as the climate-resilience side. The NJ PACT REAL rules are one of those rules, and we look forward to seeing them formally proposed, and that comment response period.

There again, it's somewhat outside my purview; I'm kind of the guy after the fact of--

SENATOR McKEON: I don't mean to say that it was only resiliency that you'd be responsible for, but 22 is 22, and 8 is 8. So, our batting average isn't great.

MR. ANGARONE: Well, so, and I say that there are a significant number of the greenhouse-gas-emission-type regs that have moved forward. But, yes, we all have a lot more work to do.

SENATOR McKEON: All right.

Thank you, Senator.

SENATOR SMITH: Any other -- yes, sir, Assemblyman.

ASSEMBLYMAN SCHARFENBERGER: Thank you.

How are you doing, Nick?

MR. ANGARONE: I'm good.

ASSEMBLYMAN SCHARFENBERGER: Been a while, huh?

MR. ANGARONE: Yes, sir.

ASSEMBLYMAN SCHARFENBERGER: So, I just have a question.

And, all of this-- Nobody can disagree that we need to harden the infrastructures, we used to say.

But, in New Jersey, you always have to be concerned about property value. So, I know in addition to houses being elevated, there will be a deed notice that a property could flood -- or will flood -- required on deeds.

MR. ANGARONE: Are you referring to the flood-disclosure law?

ASSEMBLYMAN SCHARFENBERGER: Yes.

MR. ANGARONE: So, the flood-disclosure law requires when you are selling your property, you disclose whether you are within a vulnerable area based on the mapping, or whether you have experienced flooding in the past. And, the same goes for rental. So, that's part of the contract.

I'm not aware of whether it needs to go into the deed, but that's also kind of beyond my certain bubble of activity.

ASSEMBLYMAN SCHARFENBERGER: OK, because, anything that would have an impact on property taxes, certainly residents would be concerned about. And, it does have a ripple effect, too, if an individual property tax -- property value -- is devalued, on municipal budgets, on Board of Education budgets.

Has all of this been taken into consideration, or any sort of analysis, then, on what this would mean in these affected areas?

MR. ANGARONE: So, again, I'm not sure if you're referring to the flood-disclosure law, or you're referring to the NJ PACT REAL goals, which will be proposed.

As for the rules, there is a very comprehensive analysis -- economic analysis, housing analysis, smart-growth analysis, environmental analysis -- that go into it, and I believe the answers to your questions can be found in that document.

ASSEMBLYMAN SCHARFENBERGER: OK, thanks.

SENATOR SMITH: Yes, sir.

ASSEMBLYMAN INGANAMORT: Thank you very much, Chairman -- Chair*men*.

And, thank you very much for being here; that was very interesting information that you shared.

I wondered if you could help me understand some of the numbers here, and I'm truly asking you to just correct my understanding -- what I *think* I heard.

I think you made reference to a 2.1-foot sea-level rise. Was that by 2050?

MR. ANGARONE: Yes. It is likely we will see 2.1 feet by 2050.

ASSEMBLYMAN INGANAMORT: Two-point-one feet by 2050. And, then, just to continue this through a little bit further into the future -- a combined or total 5-foot sea-level rise by 2100?

MR. ANGARONE: Correct.

ASSEMBLYMAN INGANAMORT: Got it; OK.

So, my comment and question to you would be, if we are considering laws to mitigate what you project to happen -- which will have significant impact on land-use regulations and economic-development ideas and so forth, I have to ask the question: What level of certainty do you have -- what level of probability, from a statistical sense -- in these projections?

MR. ANGARONE: So, I will actually suggest that is a question for some of your other witnesses who can speak to the detailed science of it.

How we read the scientific reports that they've provided us is that, kind of within the likely range of using a moderate emissions scenario -- we're not even talking about a kind of high-emissions scenario in this case -- there's a range of options, and within that likely range, we are looking at the upper end of that likely range. There have been multiple questions and

conversations and suggestions about, shouldn't we just use kind of the 50% chance?

And, the way I interpret that means we would be basing the health and safety decisions -- our development decisions -- on the same likelihood of a coin flip. To me, that doesn't make good policy; doesn't make good state -- public policy.

And, so, we've chosen what we feel is a projection that is supported by science, but protective of communities throughout the state.

ASSEMBLYMAN INGANAMORT: Thank you, I really appreciate that.

And, I will ask that question again to whichever witness is best suited to answer that. Because if I read the materials correctly, it sounded like the probability was significantly under the 50%. I could have read it incorrectly, and look forward to being corrected on that.

Thank you.

SENATOR SMITH: Assemblywoman.

ASSEMBLYWOMAN COLLAZOS-GILL: Just one more question.

You mentioned that funding, that obviously funding needs to be up, according to this project. What kind of funding, and what would this funding be -- for what kinds of specific projects are we speaking about that are needed? Like, just give me some sort of-- Because we do have very individual, as you made clear, but we have local municipalities.

So, I'm wondering, where do you think the resources should go, and what kind of projects do you think we should be targeting?

MR. ANGARONE: Sure.

So, I think-- So, there's, again, there's a very wide range of the types of activities that are needed. We kind of based that, again, on legislation that you've all provided. We've been assisting local governments, understand how they can kind of develop stormwater utility, and we're providing support to do that.

We are-- There's, I think, a significant need for kind of, I'll say -- call it neighborhood-level stormwater green infrastructure to help kind of -- not the massive Sandy- and Ida-type events, but the kind of repeated events that are getting worse and that we're seeing over and over. That green infrastructure, by the way, also has the added benefit of helping decrease urban heat-island impact, and neighborhood beautification.

We could spend significant resources on kind of restoring a lot of our hardened shore to a more natural state. There's an increasing need for shore protection. We saw significant erosion from winter storms on our beaches and dunes this year, and it is becoming -- that what used to be kind of nuisance erosion is becoming more of an issue that we need to deal with more frequently and in-between kind of the periodic times that Army Corps comes back and helps us.

I'm a planner, so I think every municipality in the State and every multi-municipal region in the state needs to have comprehensive risk-informed land-use planning. We, again, we do that a lot through our Resilient NJ Program. We've used Federal funds, both competitive funds, and our annual funding from NOAA, to work with over 40 municipalities -- that's a small number, considering there's 564 in the state.

And, so, if we look at kind of New Jersey's applications to Federal awards, and perhaps the State Hazard Mitigation Officer can talk about

FEMA's BRIC program. We've had-- There's multiple millions of dollars beyond what is able to be awarded. So, there is no -- there is no lack of projects and activities and plans and needs from, again, from the planning to the kind of the green and natural infrastructure, to the hardened infrastructure and, again, that suite of all of the above.

SENATOR SMITH: So, I'm going to also add a little bit to your answer.

The law in New Jersey now is that when a municipality updates its master plan, and you're required by law -- because of a law done, I think, by Senator McKeon, to do that every 10 years -- sustainability, resilience, now have to be elements in the master plan. So, the 567 towns are in that process-- Every year, we get more and more towns into that planning process. And, some are doing it without waiting for the 10 years, because it's such an important issue.

And, then, secondly, a tool that all municipalities in the state have, but as I understand it, we've only had one take advantage of it, is a stormwater utility. They're legal in New Jersey. DEP has provided guidelines for what -- how the stormwater utility should be set up. Not new government; your existing sewer utility program or water utility program. But, what it does is it collects a small, a vig -- which is the right term down here in South Jersey -- it collects a vig from large -- from property owners who have large, impervious surfaces. And, that money is put together to start dealing with your stormwater problems. Because we know how tight money is for municipalities.

But, they have a tool, and if they're not using it -- and, if you need -- whatever town you're in, you should call the Mayor's office and ask,

"Do we have a stormwater utility in X?" And, if they don't, somebody should go to a town council meeting and say, "We have a tool that we can use to help minimize these impacts, stormwater utilities." There are only 1,500 of them around the country. Only one in New Jersey, so.

Any other -- last call for questions?

OK, Senator Tiver.

SENATOR TIVER: So, we're talking 2050 and 2100, so to speak.

And, if we're going to make these -- some of these properties undevelopable now, isn't that going to hurt municipal and county budgets, because we're taking them off of the tax revenues, so to speak?

You spoke about Blue Acres. In my town, we have the river going through, and a lot of the residents are selling to Blue Acres, and they're demoing the houses, and they come off the tax rolls, and all that. That's putting a huge hole in the budget.

So, I guess my comment would be, wouldn't it make sense to try to do this incrementally, going up to 2050, instead of trying to do like, a hard now?

MR. ANGARONE: So, I say that the regulations-- There's no no-build zone that stems from the regulations. If I'm going to vastly oversimplify, you have to build higher and you have to recognize that you're vulnerable. So, that's, again, my vast oversimplification of 1,000-plus pages on regulations.

As for Blue Acres-- Blue Acres, I think, is, it's fair to say, the most successful buyout program nationally. It is recognized as a national best practice. But, I think we can't-- We should also not over-rely on that

program. That program has been in place since 1995, and it has purchased 1,100 properties. The number of properties in vulnerable areas that have been developed since that time is astronomically higher.

So, again, all of the above. Blue Acres is a part of those answers. The number of -- I can't speak to any certain -- certainly can't speak to any municipality's individual budget, but, across the state, there are not a number -- a significant number -- enough buyouts -- that are having a significant net statewide impact on budget. But, again, *not* speaking for individual local government.

SENATOR SMITH: So, Mr. Angarone, we appreciate you being a witness here today.

And, tell the Commissioner, from us, you did a good job, OK.

MR. ANGARONE: I appreciate that; thank you.

SENATOR SMITH: Our next witness is--

ASSEMBLYMAN KENNEDY: Lieutenant Dinan Amin--

LIEUTENANT DINAN AMIN: Yes--

ASSEMBLYMAN KENNEDY: State Hazard Mitigation Officer.

SENATOR SMITH: OK, so, what is it that you do?

And, tell us what *we* should be doing.

LT. AMIN: Certainly.

Well, good morning; thank you for having me, ladies and gentlemen.

My name is Lieutenant Dinan Amin; I am the State Hazard Mitigation Officer for New Jersey, and also the Unit Head of the Mitigation Unit, which resides within the New Jersey Office of Emergency Management within the New Jersey State Police.

The Mitigation Unit within the New Jersey Office of Emergency Management -- NJOEM -- facilitates funding from the Federal Emergency Management Agency, in support of local and state mitigation efforts, with the primary objective of protecting life and property.

Local state hazard mitigation plans enable FEMA grant funds by outlining the strategies and actions jurisdictions will take to reduce the risks from natural hazards. The Hazard Mitigation Planning Process is a critical tool for communities seeking to reduce disaster risks and access FEMA grant funds. It provides a structured approach to identifying hazards, assessing risks, and prioritizing mitigation actions -- ensuring that resources are allocated effectively to enhance resiliency and protect lives and property.

Over the last decade, New Jersey has experienced an increased risk due to climate change's amplification of natural hazards. Recently, New Jersey's experienced uncommon hazards such as a 1,000-year, six-hour rainfall total, and an Enhanced Fujita Scale EF3 tornado. Weather extremes are becoming more frequent in New Jersey, and NJOEM is actively working with our state partners, local community, educational institutions, and contracted support staff, to develop hazard mitigation guidance and tools and the capacity and capability at the local level to address these hazards.

Climate change is amplifying the threat of natural hazards. Through planning and project implementation, NJOEM continues to reduce the risk of those hazards by identifying them in the State Hazard Mitigation Plan, and scoping projects to mitigate them. New Jersey faces some hard financial choices ahead in maintaining its coastal community that's being increasingly impacted by the effects of climate change. Communities are and will continue to face resource and capacity constraints. New Jersey's coastal

economy generates over $60 billion per year, thus being a key driver of New Jersey's diverse economy.

Unfortunately, these coastal areas face a variety of challenges in the world where storms are more powerful; sea levels are rising; and continued climate impacts are inevitable. Optimizing the resources we use to address these challenges is a key priority for NJOEM, and something that we take to heart. New Jersey Department of Environmental Protection's new regulatory approach is a great example of a natural compliment to NJOEM's efforts, whereby it reduces vulnerability in developed environment by anticipating the increased impacts of tomorrow's storms and events.

Our efforts should future-proof today's mitigation efforts against tomorrow's conditions. NJDEP's rule intersects with NJOEM by requiring an increased elevation or flood proofing for coastal structures that will increase the level of protection for life and property, thus reducing the strain on the local community officials to respond to disasters. Encouraging nature-based solutions to protect communities from flooding -- which aligns with FEMA's goals, and thus creates a greater likelihood of projects selected for funding. Improving the State's alignment with FEMA, which allows for continual FEMA grant funding through the Flood Mitigation Assistance Grant Program, which has brought in $80 million of Federal funding to assist with flooding within the last decade. And, improving DEP's permitting process, which better assists NJOEM in eliminating duplication of Federal benefits, and ensuring structures are built to withstand future hazards.

SENATOR SMITH: So, let me interrupt you for a second.

What's the number? How much money do we need in New Jersey to make a significant dent in our flood exposure or any other type of global climate-change exposure?

LT. AMIN: So, Senator, that's a great question, and across the nation, the amount of applications that are being applied for for FEMA grant funding, and the amount of hazards that are proposed, are more than the available funding that's available.

So, our best approach in New Jersey, as we're working through these local and state hazard-mitigation plans, is to continue identifying these risks and provide as much grant funding as possible--

SENATOR SMITH: Yes, but stop on the grant funding.

The Federal Government is broke. We have trillions of dollars in debt. And, New Jersey doesn't want to be -- I think -- waiting in a long line hoping to get a grant.

Maybe what we should do is a bond issue, specifically for flood-mitigation sustainability projects that could be used all over the state. But, in order to do something like that, we need a number. How much money does your office believe is needed to give New Jersey municipalities a chance?

LT. AMIN: So, our office works in line with DEP and DCA -- the Division of Community Affairs. So, in regards to that, the State Hazard Mitigation Team is the one that kind of develops the actual priorities list for funding.

SENATOR SMITH: Is there a priorities list?

LT. AMIN: There is, and it's based within the State Hazard Mitigation Plan.

So, what I can do is I can get back to you in talking with DEP, DCA, and the Governor's Office, and we can look at, perhaps, getting you--

SENATOR SMITH: Well, in line with Senator Tiver's comment about trying to do incremental improvements to protect our citizens, tell us what we need to do; tell us the price tag; and maybe we put a bond issue to at least start the process. But, we need information -- one of the reasons we're having this hearing.

So, I'm going to ask Celia to send one of her intense communications to you and your office, and maybe -- tell her who else -- say, "Give us the list. Give us the priorities list. What will be a reasonable number for New Jersey to start to invest in this infrastructure?" And, then let people decide.

At the end of the day, the citizens of New Jersey are going to be really angry at us because we didn't do enough to help them. Don't start now.

And, Senator Tiver -- I think -- is implying we're not going to get much done. So, we need information, OK.

LT. AMIN: I can definitely get the number back to you.

SENATOR SMITH: All right; sorry to interrupt.

LT. AMIN: Not a problem, Senator.

The Mitigation Unit has obtained more than $1.1 billion in Federal funding since Hurricane Sandy through FEMA grants, such as the Hazard Mitigation Grant Program; the Building Resilience in Infrastructure and Communities Program; the Flood Mitigation Assistance Program; and the Congressionally Pre-Disaster Mitigations Program -- along with the Safeguarding Moral Revolving Loan Fund, and the High-Hazard Potential

Dam Grant Program. Through these grant funds, we've been able to assist the local community in their mitigation efforts, as identified in their Hazard Mitigation Plans. NJOEM is a leading funder of NJ DEP's Blue Acres Program.

In the coastal counties of Atlantic, Cape May, Cumberland, Middlesex, Monmouth, Ocean, and Salem, approximately $112 million has been invested to increase the resilience of critical infrastructure; $57 million to elevate structures; $37 million to protect the shoreline; and $30 million to complete power redundancy work. Further inland, $146 million has been invested to acquire flood-prone properties.

A few larger coastal community grant examples are Cape May County's BRIC Award, for their floodwall project to harden their Municipal Utilities Authority's wastewater-treatment facility from flooding, and an FMA award for seawall repair and replacement, which increases the floodwater protection to the community; Highland Borough's BRIC Award for stormwater management, which increases the capacity of stormwater while improving pump stations that aid in reducing flooding within the community that negatively impact critical facilities; and Monmouth County's HMGP award, to replace sewer pump stations within the Two Rivers' Water Reclamation Authority, thus protecting the sewer service for more than 75,000 homeowners.

Through the Two Rivers Grant, NJOEM was able to leverage a partnership that allowed their local contribution to this project to offset the local match for the remainder of all State projects submitted under this disaster, including many underserved communities.

Working with our state partners, academic collaborators, and local county officials, NJOEM will continue to seek innovative approaches to mitigate the risk from natural hazards.

I thank you for your time, and that concludes my testimony, barring any questions--

SENATOR SMITH: We thank you for your testimony.

Are there any questions for Lieutenant Amin? (no response)

Thank you for appearing today; we appreciate it.

LT. AMIN: Thank you.

SENATOR SMITH: Our next witness is Professor Anthony Broccoli, distinguished Professor of Atmospheric Science at Rutgers University.

So, Professor, how much trouble are we in?

A N T H O N Y B R O C C O L I, Ph.D.: OK, well, I'll try to give you my perspective on that.

Thanks for the invitation to come here today and talk a little bit about climate change.

I am also Faculty Advisor for the New Jersey Climate Change Resource Center, and they recently released their State of the Climate report for 2023. I am going to briefly review some of the findings of that report, starting with a global perspective, and then eventually drilling down to the local level.

Global temperature has risen approximately 2 degrees Fahrenheit since the late 19th century, rising more rapidly in recent decades. As you've already heard from Nick Angarone, 2023 was the warmest year on record, and the 10-year period from 2014 to 2023 was the warmest, going back to

1880. And, based on what's been happening this year so far, it's entirely possible that the global temperature record will be broken again.

Rising temperatures have caused global sea level to increase. Sea level has risen by about 7 inches over the course of the 20th century. That happens for two reasons: As the ocean warms, the water expands and that increases the volume of the ocean, and, during the past several decades, the second reason has come into play, which is the great ice sheets that cover Greenland and Antarctica shrinking, and the water from those ice sheets being added to the ocean. As a result, sea-level rise is accelerating, and when we look at just the past 10 years, the global rate of sea-level rise has doubled to about 1.8 inches per decade.

If we turn our attention to climate in New Jersey, average annual temperatures have risen by about 4 degrees Fahrenheit since the late 19th century -- so, roughly twice as fast as the global average. We've had warming in all four seasons, although the most rapid warming has been happening in winter. Much of this warming has taken place since 1970, and, over that time, the temperature has risen about two thirds of a degree Fahrenheit per decade.

Of the 20 warmest years since 1895, when records began, 15 of them have occurred since 2020, including 2023 -- which, for New Jersey, was the third-warmest year on record. As you might expect, given a warming world, in New Jersey we've experienced more warm extremes and fewer cold extremes. If we look at monthly extremes and define an unusually warm month as one that's among the five warmest for that time of year, and an unusually cold month, one that's among the five coldest for that time of year,

unusually warm months have been much more prevalent than unusually cold months -- outnumbering them 48 to 0 since 1990.

In addition, the 12 warmest summers in New Jersey have all occurred in the past 25 years. Our state has also received more rain in recent years. Annual precipitation in New Jersey has increased by just under 10% since statewide records began in 1895. Although that trend is relatively small compared to the year-to-year variability of precipitation, there have been large increases in the amount of precipitation falling in heavy rain events.

In the northeastern United States, including New Jersey, the number of days on which precipitation of 2 inches or more occurs has increased by 49% since 1958. And, that trend is expected to continue as heavy precipitation events are anticipated to become more intense and more frequent as temperature increases. And, that has implications for the frequency of inland flooding along New Jersey's rivers and streams, and Nick mentioned, of course, the very unfortunate flooding impacts that happened with the remnants of Hurricane Ida.

There are other important effects of climate change that will impact residents of New Jersey, including greater vulnerability to heat-related illness; increases in the ranges of insect pests; changes in coastal ecosystems, including abundances of fish species in the ocean; and increased chances of wildfires and wildfire smoke. But, here at the Jersey Shore, the greatest potential impact of climate change is sea-level rise.

In New Jersey, sea-level rise has been happening more rapidly than the global average because at the same time water levels are rising, the land is subsiding or sinking. In Atlantic City, sea-levels have risen by more than 18 inches since records began in 1911. Although the effects of the rise

in water levels is noticed in many ways, probably the most noticeable impact on the short-term is an increase in sunny-day flooding. And, Nick Angarone referred to this, and, I'll give you some statistics.

During the 1950s, that kind of sunny-day flooding in Atlantic City averaged less than one day per year, but that rate had increased to about eight days per year in the decade ending in 2016. As the ocean continues to warm and glaciers and ice sheets continue to melt, sea-level rise is expected to accelerate. According to the most recent Rutgers-led report of the Scientific and Technical Advisory Panel, by 2030 sea-level is expected to rise between 0.5 and 1.1 feet relative to the 1991 to 2009 baseline, and 0.9 to 2.1 feet by 2050. The panel uses ranges to represent the outcomes that have a two-in-three chance of occurring. Smaller or larger increases are possible, but unlikely.

Beyond 2050, the amount of sea-level rise will depend on future emissions of heat-trapping greenhouse gases. In a moderate emissions scenario, the likely range of sea-level rise in 2100 is expected to be 2.0 to 5.1 feet. Higher emissions would lead to greater sea-level rise, and lower emissions to smaller amounts of sea-level rise. Rising seas will dramatically increase the threat of coastal flooding, not only along our oceanfront beaches, but also along Delaware Bay, coastal back bays, and the estuaries of rivers such as the Delaware, Raritan, Passaic, Hackensack, Mullica, Morris River, to name just a few. By 2050, sunny-day or nuisance flooding in Atlantic City is projected to occur at least 85 times per year, even with moderate greenhouse gas emissions.

But, the most severe impacts will occur when coastal storms drive water towards the coast. These storm-surge events can raise water level

several feet, and their effects will be added to the effects of rising seas. Hurricane Sandy was an extreme example, producing 5-9 feet of storm surge along much of the New Jersey coast. But even a strong winter storm can produce 2-3 feet of surge.

How will climate change affect coastal storms? This is an important but challenging question that is the subject of ongoing research. There is good evidence that a warming climate will make hurricanes stronger and wetter; whether they will change in frequency remains uncertain. A more common occurrence along the Jersey Shore are winter storms -- often called Nor'easters -- which typically bring the threat of some coastal flooding several times every year. The relationship between warming and the intensity of winter storms is not as straightforward as it is for hurricanes, and continued research will be required to anticipate how those storms will change in the future.

Despite the uncertainties that I've just mentioned, we *can* say something about the bottom line for coastal communities. There is high confidence that coastal flooding from future storms will be more frequent and more severe as rising sea levels raise the baseline for such flooding events. For example, some of my colleagues at Rutgers have estimated that the rise in sea level since 1880 caused about 38,000 more people in New Jersey to be affected by Hurricane Sandy's floodwaters. The future rise in sea level will, likewise, increase the areas at risk of coastal flooding.

Many of our traditional strategies for planning for future weather and climate events assume that they will look a lot like the events that we've experienced in the past. Climate change invalidates this assumption. Instead, we must prepare for and adapt to conditions that will likely be quite

different from what we have seen in the past, because the primary driver of future climate change is the emission of carbon dioxide and other greenhouse gases into the atmosphere. There is the potential to reduce the impacts of future climate change through the development of alternate sources of energy and policies to discourage carbon dioxide emissions. But, regardless of what policy direction we ultimately follow, we already are experiencing changes in climate, and there is no realistic scenario in which future changes can be completely avoided.

With that sobering fact in mind, it will be necessary to adapt to the changes in climate that are already in the pipeline -- even if policies are implemented to reduce carbon emissions worldwide. Adapting to a changing climate is a process that must be informed by the best available science. We can't adequately prepare if we don't know what impacts are coming. Fortunately, the tools we use to make projections of future climate are steadily improving. Furthermore, climate resiliency efforts here in New Jersey are well under way, as you have heard and *will* hear from some of the other witnesses at this hearing. Such efforts are crucial if we are to meet the challenges posed to our communities by climate change -- which is arguably the most important environmental issue of the 21st century.

To the Committee chairs and members, thank you again for the chance to talk to you today and provide you with an overview of this critical issue.

SENATOR SMITH: Thank you, Professor, for your contribution to the hearing.

Are there any questions for Dr. Broccoli?

Senator Greenstein.

SENATOR LINDA R. GREENSTEIN (Vice Chair): Thank you.

Thank you very much. I mean, the statistics are great, and they're also sobering.

I was just wondering if you could give us a couple of your thoughts on what we can do on a practical level at this point. For example, do you believe we should start small, or are we at a point where we need to start big? Obviously, money is always a problem, but what are some of the steps you think we need to take, both big and small, to move forward at a time like this with so many problems?

DR. BROCCOLI: Well, addressing the root cause of climate change involves reducing greenhouse-gas emissions. And, New Jersey has made progress in that area, but, of course, we need to have that progress happen globally -- not just locally.

And, it's a daunting challenge, because, in order to stabilize the climate, greenhouse-gas emissions have to essentially be reduced to almost zero. So, that's a big task, and that's why I say that there is more climate change in the pipeline, and so the other most important thing we have to do is develop strategies to adapt to the changes in climate that, at this point, we can't avoid. So, that means preparing so that the impacts of the changes in climate don't harm our communities, don't harm society as much as they would without adaptation.

SENATOR GREENSTEIN: I guess, in terms of the shore and what might happen here, I heard somebody speak a couple of years ago, suggesting that people shouldn't move to the shore; they should be very careful about that. He was taking a pretty extreme position, I think.

But, what are some of your thoughts, specifically about the shore, practically? What should happen here? Should there be any changes in what people do?

DR. BROCCOLI: I think that's a very tough question, and I'm not going to duck it, but it is a tough question.

I've been spending time at the Jersey Shore since my childhood -- like a lot of other people have -- and it means a lot to be able to come to the Jersey Shore.

I think it's impractical, at this point, to imagine that the Jersey Shore is going to be abandoned. But, if we have large sea-level rise, it's obviously going to be very difficult to maintain the status quo.

So, changes to make people who live at the shore less vulnerable so that their homes aren't flooded as frequently when storm events occur, so that we can do a better job of getting people out of harm's way, so that we're prepared for that -- I think those are the things that are going to be required in order for us to live at the Jersey Shore, visit the Jersey Shore, in a changing climate.

SENATOR GREENSTEIN: Thank you.

SENATOR SMITH: Any other questions?

ASSEMBLYMAN KENNEDY: I have no questions, Senator.

The next witness is Professor Ning Lin, Civil Engineering at Princeton University.

N I N G L I N, Ph.D.: Hello, everyone.

Thank you for having me. It is my great pleasure here to talk about my research at Princeton University.

SENATOR SMITH: Would you pull the microphone a little bit closer? Pull the microphone a little bit closer to you, so you can be heard by everyone.

DR. LIN: Can you hear me better? OK, sure; thank you.

So, before I get into my talk, I want to-- First, I have to note that the views expressed in this testimony are my own, and I am not speaking as an official representative of Princeton University. I am talking about my own research perspective and my thoughts on hurricanes and climate change.

So, given my background in civil engineering, I've been always concerned about reliability of buildings and the infrastructure to environmental loads, including earthquakes and hurricanes, and I have been concerned about climate change; if climate change would make hurricanes stronger or more frequent; would our infrastructure system still be reliable as much as they were designed to be?

So, back in 2010, when I was doing my Ph.D. at Princeton, I searched literature about hurricane storm surge and the effect of climate change. I found that most research were focused on the Gulf of Mexico and the Florida areas, and with very limited research on storm-surge risk at higher latitude, including the New Jersey and New York regions. So, I decided to work on this area, and I pursued a NOAA Climate Change Post-Doctoral Fellowship, to work with Kerry Emanuel at MIT, the leading expert on hurricane signs, on storm-surge risk for this region. And, we published a paper in the February of 2012 on nature climate change, suggesting that this region will have significant storm-surge risk, and storm-climatology change and sea-level rise would make the storm-surge flooding risk for this region, specifically New York City, 100-year flood level to occur every three to 20

years, by the end of the century, and a 500-year flood level to occur every 25 to 240 years by the end of the century.

So, this paper got a lot of attention and, also, I got to move back to Princeton to join the faculty. Just a few months later, in late October, we had Hurricane Sandy. And, a week over-- After Hurricane Sandy, there was a *Time Magazine* special issue featuring the Presidential election and Hurricane Sandy citing our paper. So, people start to say that we predicted Hurricane Sandy. But we said, "No, we didn't predict Hurricane Sandy, we just predicted or estimated the projected -- the likelihood or probability of -- extreme events like Sandy, or some other storms, to occur in this region. And, that is precisely the information we actually need for our long-term planning and the investment in decision-making for coastal resilience.

So, for coastal resilience -- as talked about -- sea-level rise is the biggest factor in terms of changing coastal flooding risk. But, another important factor is trending storm climatology -- or activity -- and which it has been often neglected. So, the challenge here is that global climate models cannot (indiscernible) of hurricanes, given their relatively limited resolutions. So, in order to understand the hurricane risk at a particular region, we would have to perform so-called "climate model downscaling."

So, over the past few years, my group has developed Princeton Environmental Dependent Probabilistic Tropical Cyclone model -- we call PepC -- to be able to generate synthetic storms under climate conditions for any given location. So, we have applied this model to generate tens of thousands of possible -- or, synthetically possible but physically possible -- storms for New Jersey/New York region. And, we found that for the New Jersey/New York region, in order to capture the impact of storms, we have to

capture not only the frequency and intensity of the storm, but also the futures of storm tracks. For example, Hurricane Sandy's track -- which was perpendicular to the New Jersey coast and the counterclockwise wind -- pushed water right into New Jersey and New York. So, we found that most downscaling models cannot capture those features of the tracks. So, we made specific efforts to adjust the model to capture – well, capture those tracks in the current climate condition. And, we are currently investigating if such tracks would happen more frequently in the future climate, given climate change.

Once we have generated the storms, we can use hydrodynamic models to model coastal flooding. Given high-resolution data of the symmetry and the topography, those hydrodynamic models can give us a quite accurate estimation of a storm surge along the coastline. But, as also mentioned, that when we look at the inland areas, hurricanes bring heavy rainfall and rainfall flooding. And, in between inland and coastal regions, we have compound flooding, which contributed from storm surge and rainfall.

So, our current modeling framework for flooding is to be able to account for all these flood drivers to be able to map the compound flooding from coastline inland -- towards inland regions. In this framework, we would have to model the wind storm surge and rainfall from tropical cyclones or hurricanes consistently. And, we need to use high-resolution climate models to generate those storms and use higher-resolution inundation models to take the input from storm surge, rainfall, (indiscernible), astronomical tide, riverine flow, to estimate the total flooding or compound of flooding. And, based on the large number of synthetic storm simulations, we'll be able to

generate a statistical estimation of the extreme flood levels for any given location.

So, we're currently applying this approach to quantify compound flood hazards for selected cities in Philadelphia and New York as part of an NSF mock project that Lisa is going to talk about. And, we are going to apply this approach to quantify the compound flood hazards for all 16 New Jersey coastal counties for the DEP Climate Resilience Project just awarded by NOAA.

A final perspective I want to talk about is that, as mentioned, coastal regions may face not only increasing flooding, but also increasing heat waves. How about if they come together?

So, back to my background in engineering-- I am concerned about the power system, the infrastructure's resilience to the hurricanes. As we know that nine out of 10 largest blackouts in the United States -- caused by hurricanes. What happens if we have heat waves when we lost the power and air conditioning? So, this so-called "hurricane blackout heatwave compound hazards" are emerging. So, they are very real in the history anywhere in the world, but they've been happening in the United States in recent years.

For example, we had Hurricane Laura in 2020, and Hurricane Ida in 2021 in Louisiana, and then Hurricane Beryl in July this year in Texas. They all generated large-scale power failures that required multiple weeks to fully recover -- during heatwaves. And, in the future, on the climate change, as hurricanes become stronger and heat waves get stronger, we may see more such compound events. Also, we are going to have larger scale integration of

renewables, which rely on the environment, and they may, in fact -- will increase uncertainty in the power modeling, power supply demand balance.

So, another part of the (indiscernible) project, we are currently modeling the impact of hurricanes on the power system in the New Jersey/New York/Pennsylvania region and investigating the possibility of heat wave compounding on the climate change.

So, that's my basic introduction. I'd be happy to take your questions.

SENATOR SMITH: So, have-- First of all, you're doing great research. It could be very helpful in deciding what infrastructure needs to be built where; where we should be spending our money; and our resources.

But, let me ask: Are you working with the New Jersey Office of Emergency Management and the DEP? Are they aware of the information and the models that you have? For example, in the case of the OEM -- Office of Emergency Management -- they're making predictions. We're trying to tell towns, "You're in the target; you have a big problem." Are you sharing that information with the state agencies?

DR. LIN: Yes. So, we are working with DEP, actually. We're a part of the NOAA grants just awarded to DEP's Climate Resilience Project. So, my team will be responsible towards generating the compound flooding for the 16 coastal counties in New Jersey to support their--

SENATOR SMITH: If you don't mind, also, CC the Office of Emergency Management. I don't know if DEP -- I never know who talks to who in State Government, but it would be good if they were also CC'ed, whatever you're doing, because they're also projecting onto municipalities what your risk level is. And, your models will help determine that.

DR. LIN: Of course.

SENATOR SMITH: So, you guys should exchange cards -- if you're not already talking to each other--

DR. LIN: Sure--

SENATOR SMITH: OK.

Questions for Professor Lin? (no response)

Thank you very much, Professor, for participating today. The information was very helpful.

DR. LIN: Thank you.

SENATOR SMITH: Our next witness is Lisa Auermuller, Administrative Director of the Rutgers University Metropolitan *(sic)* Coastal Transformation Hub -- not transportation, transformation hub.

Lisa.

L I S A A U E R M U L L E R: Thank you.

Thank you for the honor of being here today, and for the opportunity to share how Rutgers University has been at the forefront of making applied research usable and useful to decision-makers like you.

The roles I have at the University allow me to act as a bridge between research -- like you just heard from Tony and Ning -- and professionals working along the coast of New Jersey, who may not have a science-based background, but who are seeking information to inform their thinking.

I have been at the University for over 20 years now, and I have always had the benefit of working at the coast. Currently, I serve as the administrative director for the Megalopolitan Coastal Transformation Hub

-- but, we'll just say MACH, to make it easier -- and I am a member of the leadership team for the Rutgers New Jersey-led Climate Resource Center.

In addition to my professional titles, I am a resident of a small coastal community in southern Ocean County. It is not uncommon for me to receive texts from the school district alerting our family that bus routes would be altered due to flooded roadways -- even on sunny days. Further, my daily commute out to work at the Rutgers University Marine Field Station reminds me daily how precious our coast is and how very exposed and already impacted we are by climate change.

As Rutgers staff embedded at the coast, we are considered trusted sources of science-based information, and anchors in the community. It is through this shared experience that I have with community members and decades of relationship building with coastal decision-makers that we, as Rutgers staff and scientists, are able to continue to provide useful and used information to help coastal communities become more resilient.

Today, I am going to cover the following topics with you: How the Climate Change Resource Center is key to improving New Jersey's climate resilience and adaptation; ways in which the MACH consortium builds on our success in New Jersey and expands it to other large urban mega regions in the states surrounding New Jersey; and, then, finally, I am going to wrap it up by letting you know how we're training the next generation of coastal professions to tackle these multi-faceted challenges.

Before I dive in, I think it's important that you know when I use the word coast, I mean any area that's influenced by the tide -- just like your map is showing. I am not just talking about the shore and the beaches.

I also want to thank all of you for your ongoing commitment to our work at the Climate Change Resource Center in New Jersey. The Resource Center will continue to provide applied research tools, technical guidance, and training to professionals across the coast. We draw upon the expertise of all of New Jersey's world-renowned scientists to design and develop products and services that meet the needs of our users.

Some of the flagship Resource Center products include the NJ FloodMapper, the Municipal Climate Snapshots, and NJ Health Adapt. These tools are all hosted under the umbrella of a website known as the NJ ADAPT platform. Our NJ FloodMapper tool alone has about 60,000 users annually. And, with all due respect, I would love to see a NJ FloodMapper map up, and I can work on making sure we can get that to you.

SENATOR SMITH: We accept exhibits at any time.

MS. AUERMULLER: Great, I will make sure we get that to you.

I do want to acknowledge that we know tools alone are not going to be sufficient. They're one set of approaches that the Climate Change Resource Center utilizes to make meaning out of climate science data. We pair tools with things like technical assistance, guided questions, and learning modules, and ensure that the data provided connect to what decision-makers value and already know, so that our new knowledge we're providing is additive to their lived experiences and their local knowledge.

One example of how we take data like sea-level rise and turn it into meaningful knowledge can be demonstrated in an analysis of what 5 additional feet of inundation would mean to the coast. This example is particularly relevant, as we've already heard this morning, because 5 feet is the amount of sea-level rise proposed through the New Jersey PACT REAL

rules. Using the NJ ADAPT platform, a local construction code official could map what 5 feet of local inundation looks like against other local datasets, such as roads, schools, police stations, fire stations, nursing homes, and other critical local assets. Zooming out at a statewide level, State flood plain programs could learn what 5 feet of permanent inundation would mean, which, based on our analysis, is more than 123,000 residential properties and about $27 billion in property value. These data can be particularly useful for municipalities as they develop the climate-change-related Hazard Vulnerability Assessment that you've talked about earlier today.

Switching hats -- the hat I wear through the MACH Consortium -- we expand our view from New Jersey out regionally to include also New York City and Philadelphia. We are working directly with city and county decision-makers to co-design new research based on their adaptation questions. With initial funding from the National Science Foundation, the Consortium brings in expertise from 12 institutions, including Rutgers, Princeton, and Montclair, all right here in New Jersey. Both Tony and Ning are team members of our research team -- and, you've heard from them today -- and several of the other people providing testimony today are members of our advisory panel.

Our researchers are examining coastal hazards such as current and future sea-level rise, hurricanes, nor'easters, and the compound reality, as you just heard from Ning, of what a future hurricane, paired with a power outage and a heatwave, might mean. We actually just saw this in Texas with Hurricane Beryl, as Ning mentioned before. We look at how all those hazards are going to interact with things like the housing market, the insurance market, and mortgages, with municipal finances and how people --

particularly the low-income residents -- make decisions about this risk. We also have a major focus on equity, or the inequity, of climate impacts and adaptation decision-making.

As I move to my third point, a key goal of the MACH Consortium and several of our other programs at Rutgers is training for the next generation of coastal climate adaptation professionals. Coastal resilience is not one topic or one skill challenge. Increasing resilience in adaptation along the coast of New Jersey is going to take an all-hands-on-deck approach, with collaboration across disciplines and sectors. Rutgers Coastal Climate Resilience graduate students are trained to think about how their own disciplinary knowledge compliments the knowledge of their peers, and work in teams across disciplines to solve problems of climate adaptation. They also learn the skills needed to participate and use-inspired research, and to lead science translation efforts with stakeholders, ensuring that their science helps to inform real-world questions.

Science communication, translation, active listening, and the appreciation of diverse perspectives are all focal areas of our graduate student training. Alumni are finding great success as early career professionals, working at jobs in the nonprofit, State, Federal, and academic sectors -- in fact, one of our students is providing some testimony for you today, which is another example of the success of this program. Through the Climate Change Resource Center, Rutgers and Princeton students are putting their training to work as members of the Climate Corps, working with staff mentors to get experience with hands-on application of their knowledge. To date, we've mentored and trained about 40 Climate Corps students, who have provided

direct assistance on a range of climate topics such as urban resilience, health, lifelines, flood-hazard analysis, and vulnerability assessment.

Additionally, looking at the K-12 student community, the Resource Center has been working in partnership with teachers and educators to develop lessons to meet the requirement of the new climate standards in education and integrating our data and tools in their lessons.

In closing, I want to share a final thought, and this is the same lesson that I try to instill in the graduate students I teach. Resilience means something different to each person. For mayors, it may mean retaining their tax base and municipal services as we've heard earlier. For natural area managers, it may mean allowing natural processes to determine the path forward and the timeline. For families who have been coming to the shore for generation after generation, it may be the ability for future generations to build the same memories. Sometimes, these various versions of the vision of resilience are going to conflict with one another. Data alone is not going to ensure resilience.

Data is the head -- the science part of our work -- but we also need to lean in to the heart part. We all need to hone skills like collaboration, listening, learning, and flexibility. The coast is part of who we are as New Jerseyans. To effectively adapt to the changing coast, we need to connect the knowledge we are building and developing about the future to what people care the most deeply about. This is the "heart" part of our work, and it is the hardest part of our work.

Thank you for the honor of being with you today, and for allowing me to share what we do and how we do it.

SENATOR SMITH: Any questions? (no response)

Thank you very much.

MS. AUERMULLER: You're welcome.

ASSEMBLYMAN KENNEDY: Next, we have Kimberly McKenna from Stockton University.

K I M B E R L Y M c K E N N A: Good morning. It is still morning, OK.

I am Kimberly McKenna; I am the Interim Executive Director at the Coastal Research Center at Stockton University.

Today, I will be focusing my comments on beach nourishment and the benefits to the New Jersey coastline over a period of study where we've been studying the coast.

In 1981, the Coastal Research Center -- and, I'm going to refer to us as the CRC -- was founded by a marine science professor who started working with the local governments because they were having issues with coastal erosion and storms. And, there really wasn't enough information to really understand how to manage their shorelines. So, we started from the municipalities, and since then we have been working with Federal and State agencies, non-governmental organizations, and then our continuation with the municipalities on these coastal-management issues.

In 1986, following the passage of Hurricane Gloria, which caused extensive structural damage and beach volume losses along the New Jersey shore, the DEP and the CRC established the New Jersey Beach Profile Network – NJBPN. I'll refer to that over and over again. And, this was for the purpose of monitoring the beaches, dunes, and shoreline conditions. Today, there are 171 sites that the CRC measures twice a year. The New Jersey Beach Profile Network dataset of the state's beaches and dunes has been invaluable in determining long-term shoreline and beach profile volume

trends; impacts from storms; and the influence of beach nourishment in protecting coastal communities and infrastructure. This dataset represents a consistent assessment of the entire New Jersey coastline -- and, I'm referring mostly to the Atlantic Ocean shoreline -- that is routinely cited as the best basis for interpretation of coastal changes in the nation.

The two elements of climate change that are expected to increase and impact the Jersey coast are sea-level rise and increased storms. From the tide-gauge records at Sandy Hook and Atlantic City, relative sea level has risen about a half a foot since we started collecting data in 1986. And, the New Jersey Coast has experienced some significant damaging storms -- some Presidential declaration-type storms; the Halloween 1991 storm; several nor'easters from '92 through 2016; Mother's Day storm 2018; Veteran's Day in 2009. But, the storm of record -- Hurricane Sandy, which occurred in 2012. Except for coastal erosion hotspots, the use of beach nourishment appears to hold off the rising seas and storms over this time period.

Referring to our storm of record, Hurricane Sandy, Hurricane Sandy's losses at the New Jersey Beach Profile Network locations were significant. We saw what we call "above datum," above 0 and AVD 88. We saw losses of 14 million cubic yards of sediment just at our sites that we had monitored. Even with the sand losses, we found that the beaches with Federally designed coastal risk-reduction projects -- those are the beach nourishment that have the engineered dunes -- these were extremely effective in protecting infrastructure and homes, mostly due to the wide beaches and the high dunes that were created in excess of 20 feet. Structures adjacent to narrow beach widths and low dunes suffered greater damages.

Post-Sandy, beach nourishment was funded by Congress -- U.S. Congress -- via public law 113-2, the Hurricane Sandy Relief Bill. This allowed the U.S. Army Corps of Engineers to fund placement of over 39 million cubic yards of sand along 113 miles of authorized project shorelines between 2013 and 2019. Continued maintenance of these projects occurs at intervals of four to seven years, and that depends on the project specifications for that particular project. And, the State and local governments are cost-share partners with the Federal government.

As a result of these beach fills -- the maintenance fills -- between 1986 and 2021, sand volumes increased and the shoreline position moved seaward from the baseline conditions from 1986 at all NJBPN locations that are located within these Federal projects. I want to note that the Wildwoods are not, at present, located within a Federal project. However, Federal funding for these projects is not always guaranteed -- it depends on the will of Congress, and these must be appropriated -- the funds must be appropriated by Congress. In addition, permitted offshore sediment resources are being depleted offshore New Jersey, and securing new borrow areas further offshore will take years and will increase costs for moving sand from those areas onto the shorelines.

From our observations, the natural beaches and dunes within State and Federal parks have had varied dune elevations and beach widths over this time period. Recovery of these areas following the storms relies on the amount of sand in the littoral system, as well as the cross-shore processes to move this sand to the beaches -- that's the waves, and how the waves move the sand onto the beaches. The real rules proposed by the DEP -- the changes -- appear to support the use of nature-based solutions such as beach

nourishment for coastal storm risk reduction. We find that large Federal-level beach nourishment projects can help maintain New Jersey's shorelines and protect landward structures. The New Jersey -- the State of New Jersey should prepare for rising costs in obtaining new sand sources and placement activities to maintain present-day shoreline positions.

Thank you for the opportunity to speak.

I have submitted some background information, if you want to review it that supports my testimony.

SENATOR SMITH: So, Ms. McKenna, has Stockton put together a priority list in terms of what beach-replenishment programs would have the greatest positive impact on mitigating global climate change?

MS. McKENNA: We-- We produce annual reports that, since the New Jersey DEP funds our research every year, we produce reports for them. And, in that, it goes over the whole-- It looks at county-wide changes and the trends over time.

But, we have-- As far as, this beach has more priority over another, we don't do that. That's-- I mean, we're there to really try to get an understanding of how the shorelines are changing both long-term and then seasonal effects, too.

SENATOR SMITH: Thank you.

Any questions for Ms. McKenna?

Assemblyman.

ASSEMBLYMAN INGANAMORT: Thank you very much.

I am very interested about the engineered dunes, and the success of that.

Let me -- a little background: When I was Mayor in Middletown after Sandy, we got hit really bad, but the one area of town that didn't get hit nearly as bad as the rest of it were the ones that had the dunes in place. And, they got dinged up a little bit, but they really stopped the flooding. And, we had gotten some money from the Feds to replace and expand the dunes with beach grass, and all that.

Do you have any data on the success rate of where that's been, where there's been no further flooding once that's been put into place? Because that would help justify, I think, for us State officials, to lobby for Federal funds coming in to point to success stories like that.

MS. McKENNA: We did an assessment immediately after Sandy, and the supplemental materials that I provided -- we produced some published reports on that, peer-reviewed reports.

We found that those areas -- because when you have substantial amounts of volume in the dunes, when waves hit the dune, it tends to widen the beaches and protect the beach, too. So, it feeds the shoreline at the same time.

From those reports, we have seen the positive impacts of having those engineered dunes, but as far as looking at vegetation and changes, we look at that only annually, and those are in those annual reports.

ASSEMBLYMAN SCHARFENBERGER: Great; thank you.

ASSEMBLYMAN KENNEDY: Thank you.

SENATOR SMITH: So, following up on that, if there's-- If you would, please, we would appreciate an email copy of the reports. Send it to Celia Smits and any Assembly person or Senator who wants it, she'll transmit it to you.

MS. McKENNA: They're all on our website, so I'll be happy to share the website information with you.

SENATOR SMITH: Great.

Any questions for Ms. McKenna? (no response)

MS. McKENNA: Thank you very much.

SENATOR SMITH: All right, our next witness is Tom Herrington from the New York/New Jersey American Shore and Beach Preservation Association. Mr. Herrington is Vice President of that group.

Mr. Herrington.

T H O M A S H E R R I N G T O N, Ph.D: Thank you, Chairman, Committee members, for inviting me here today.

I think most of you probably know me better as the Associate Director of the Urban Coast Institute of Monmouth University, but I'm very happy you've asked me to come here today to speak on behalf of the American Shore and Beach Preservation Association -- or ASBPA like we like to shorten it -- shorthand -- for comments.

So, the ASBPA is dedicated to preserving, protecting, and enhancing our coasts for healthy and sustainable coastal communities, ecosystems, and economies. As a Board Member of ASBPA for over 17 years, and the Vice President of the Northeast Chapter for five years, I can unequivocally say that ASBPA considers New Jersey a national model for shoreline management and investments.

New Jersey has a long history of investing in its coast for protection of its coastal communities. The benefits of that investment have been significant, and I think when you look at the discussions we're having here today about what do we need to invest for resilience in the state overall,

I think looking at what has been so successful since 1992 is important, and maybe will guide your thinking a little bit as you deliberate over this.

With the passage of the landmark Shore Protection Fund Bill in 1992, the New Jersey Legislature ushered in an era of sustained investment and restoring the coast and protecting the New Jersey coastal communities and economies. The creation of the Shore Protection Fund allowed New Jersey to leverage significant Federal dollars provided by Congress to the Army Corps of Engineers to build the large-scale dune and beach systems that Ms. McKenna just spoke about.

The projects were tested during Hurricane Sandy, as we just heard, and where the projects were in place there were significant reductions in damage behind those projects. As a matter of fact, the U.S. Army Corps determined that beach nourishment projects in New York and New Jersey saved an estimated $1.3 billion in avoided damages. So, that investment really paid off. After Sandy, the fund has played an important role in ensuring our coastal communities now have coastal storm-damage protection projects, along almost the entire oceanfront of New Jersey.

More projects and increasing maintenance costs, however, are straining the ability of the fund to match current Federal investments, as evidenced by the inclusion of the additional $25 million in the State budget over the last couple years. ASBPA supports the Jersey Shore Partnership's call to increase the fund to $50 million a year to cover the real cost of those projects.

In addition to providing community protection, healthy beaches and dunes provide economic and recreational benefits to all New Jerseyans, our visitors, and the nation. Traveling tourism is the largest U.S. employer,

providing 15.8 million jobs in the United States, which is 10% of all jobs nationwide. Beaches are the leading tourist destination in the United States, with over 50% of Americans saying it's their favorite vacation destination. So, New Jersey has known that for a long time. Annually, beach tourism in New Jersey -- in the U.S. -- generates $520 billion in economic output; $240 billion in direct spending; and $36 billion in taxes to Federal, State, and local governments. According to the New Jersey Division of Travel and Tourism, tourism in New Jersey generates over $49 billion in revenue annually, and $29 billion is attributed to the coastal counties. That's 12% of the national spending on beach visitation. That's pretty good for a small state.

Healthy beaches and dunes also provide critical habitat and ecosystem benefits for threatened and endangered species like piping plovers, seabeach amaranth, as well as nesting habitat for sea turtles and many coastal bird species. Restored beaches provide sediments back to our tidal marshes, which is critical for their ability to keep up with the rate of sea-level rise.

One lesson from Sandy that we need to heed is that we need to think of our coastal lands as a single system consisting of ocean beaches, inlets, bays, and marshes. Although restored beaches mitigated oceanfront damage during Sandy, significant damage was incurred in the low-lying bayshore communities. ASBPA advocates for holistic coastal management approaches that work to ensure that each part of the coastal system is maintained and managed in a way that enhances our entire coastal environment for our coastal communities, our resilience to storm events, and the coastal economy.

Under the leadership of Commissioner LaTourette and Chief Resilience Officer Angarone, New Jersey is again at the forefront of holistic

coastal-community resilience planning, leveraging strong partnerships -- as we heard the Chief Resilience Officer testify earlier today. They have been able to collaborate with practitioners and experts and stakeholders to successfully keep (indiscernible) for significant resources that were made available through the Bipartisan Infrastructure Act and the Inflation Reduction Act, including the recently announced $72 million award for NOAA for regional coastal planning to build a climate-ready New Jersey. They were the second-biggest award provided by NOAA. When I tell you that, it's a real testament to what New Jersey has been able to do.

ASBPA commends New Jersey for their leadership and coastal climate resilience. We look forward to working with you to amplify your successes, and to transfer the knowledge you are creating here to benefit all coastal communities across the nation.

In closing, I'd like to thank you again for the opportunity to testify here today on behalf of ASBPA.

I've submitted electronic copy of my comments, and I'm happy to answer any questions.

SENATOR SMITH: Any questions for Mr. Herrington? (no response)

Thank you very much, sir.

DR. HERRINGTON: Thank you.

ASSEMBLYMAN KENNEDY: Next, we have Tim Dillingham, Executive Director of the American Littoral Society.

T I M D I L L I N G H A M: Good morning, still, I guess.

Mr. Chairman, Chairman Smith, thanks for having me before you on this really important question.

First of all, I just want to recognize you for your leadership about this issue.

I mean, this-- I listened to Dr. Broccoli: nice; calm; science; facts; statistics. But, the world is basically burning up. I mean, it is. That is not hyperbole. The ocean is changing; the chemistry of the ocean is changing; the mechanics of how circulation happens in the ocean is changing. And, obviously, we are all going to be the recipients of all the consequences of that climate change that is going on.

So, I appreciate the fact that you all are stepping up, dealing with this, because there really is no choice. There's nowhere else to go. We have to approach this. Hopefully, we will minimize the impacts that we've created, but, I think you should self-congratulate yourselves, or congratulate yourselves.

Being in the camp of people who have recognized the reality of climate change and its impacts and the need to deal with it, that is-- That's leadership, which unfortunately is all too often not present. So, we're lucky to have you all.

The American Littoral Society-- Littoral means "of or along the coastline." We were founded in 1961; our headquarters are on Sandy Hook. We are dedicated to promoting the conservation and study of marine life and its habitats. We work to defend the coast from harm, and we try to empower others to do the same. So, we do a lot of work in communities.

Lisa's metaphor about the science community being the head-- I would guess that would make us the hands of the body, because we are out in the sand, in the water, in the mud of marshes all the time, both trying to

protect and restore their productivity and all the values that they provide to us.

I distributed sort of a photo log, inventory, of the work that we've done over the last 10 years. I apologize for the cover sheet. I pulled it together the first time for Chairman Kennedy last year. I added a couple new projects in there, just so you can see them. But, you'll see that they run the range of fairly large projects to protect natural features from erosion, to very fairly small-scale fish passages.

We do this work because we believe that the coastal system -- as Dr. Herrington just described it -- is front and middle. It underpins not just our natural systems, but also our local economies. Think about fisheries; think about the supply chain that relates to both recreational and commercial fisheries to the tourism that people come to the shore for.

We often don't reflect that role that marshes, dunes, beaches, bays, play in our policy. So, as we approach this question of resiliency and risk reduction, we need to think about and really put into rules, put into our programs, the need and value of linking ecological restoration with hazard management, hazard reduction.

The use of nature-based approaches -- when you look at those pictures, you'll see that we're building marshes, we're building oyster reefs. We're putting sand back on the beach. Those projects on Delaware Bay not only are providing some resiliency benefit to the poorest county in the State of New Jersey -- Cumberland County -- but they are restoring the habitat for horseshoe crabs, and, by extension, helping in the recovery of the endangered migratory shorebirds like the red knot. We actually have some very interesting science that shows that the beaches that we've rebuilt are more

productive, ecologically, than the ones that have been neglected or left to the natural state.

Using nature-based approaches allows us to avoid the negative environmental impacts of hard structures. You build a hard structure on the edge of the water, the energy of waves and everything else get reflected back into the shoreline. So, I think you'll see in places, until very recently, like in the Wildwoods, long ago in Sea Bright and Monmouth Beach. And, when we didn't pay attention to maintaining the shoreline, we had water right up to those walls. And, so, the habitats that are there -- the opportunity to use that for recreation -- all that was lost. So, nature-based approaches, we think, are really priorities; ought to be more prominent. And, just as a sort of foreshadowing to later climates, we're very happy to see that the PACT, the REAL rules, really make an effort to facilitate the use of habitat restoration and nature-based approaches to risk reduction and try to reduce the regulatory burden there.

I've been an environmentalist, but for the last 20 years, I've been sort of on the other end of the permitting process. So, I have a little sympathy for folks who have to go through that, and I appreciate the fact that Commissioner LaTourette and Nick recognized the need to really amplify the use of these approaches, and to get some unneeded regulation out of the way.

We do that work in partnership all the time -- always municipalities -- when we start a project, we ask folks to volunteer to be on a committee, a Leadership Committee, a Steering Committee. We talk about the project all the way through. We hope to help define things that the community wants out of it. And, they're involved with us as we go. The same thing for the DEP -- usually the Division of Fish and Wildlife -- and,

we've had really great partners in the U.S. Fish and Wildlife Service who provide a lot of the funding for it.

These projects really need a stable source of funding. Senator Smith has been a leader since I've known him -- we've talked about stable sources of funding; the creation of the Garden State Preservation Trust; the dedication of the corporate business taxes.

The projects -- whether you're planting a marsh or rebuilding a beach or funding fundamentally construction projects -- you're bringing materials in; experts to build it. They need money, and, it's something that we ought to be dedicating and expanding the shore-protection fund to put more of an emphasis on these nature-based approaches -- more emphasis on projects in the back bays where we experience all the flooding now. Those are things that are left out because of the dominance of beach nourishment on the Atlantic side, often driven by the Federal opportunities. But, even as Ms. McKenna noted, that's often sporadic -- comes and goes -- and is probably not as tied to a well-thought-out risk-based assessment as it should be.

The State adopted a shore master plan in 1981 that did some of the things you asked about, Senator: identified critical spots; identified where the erosional hotspots are; estimated the needs of projects. That was 1981, and it hasn't been updated since then, and I don't know how much that plan guides the decisions. When Sandy flooding and post-Sandy flooding allowed the State to do the whole oceanfront, but that's not going to be the future.

Just to talk about beach nourishment for a couple minutes, it is a complex and very controversial approach to trying to reduce risk to

development that's in the wrong place. We have a long history -- I laughed at Assemblyman Kennedy's story about his father, talking about paving over the parking lots. Well, our coastal-development policy has not been very good. We put a lot of development, and people and their lives, into harm's way by allowing the level of development that we do, in areas that we know -- we have always known -- are high risk and have consequences to building in them.

The advent of more storms, higher tides, higher sea levels, are just going to exacerbate that vulnerability. I didn't hear anybody earlier -- I may have missed it -- but, there are a whole number of vulnerability assessments which have been done, which, unfortunately, put New Jersey up there with Louisiana, Florida, places that really get kicked around by hurricanes probably a little more often than we do. So, (indiscernible) as Dr. Herrington talked about, it's effective in re-establishing beaches that have eroded over time. It helps protect coastal development. It is a replacement for recreational areas, and, in certain areas, it does provide an enhanced habitat for beach-nesting shore birds.

On the downside, it's extremely expensive; it's a temporary solution. At best, you get five years out of it. As we've seen lately, particularly in Monmouth County and in the Wildwoods, sometimes that timeframe is much shorter, so you incur those expenses repeatedly. As folks who are concerned about fish, we are concerned about the impact of the dredging of the sand on fisheries habitat and on fish and their health. Ms. McKenna said that now we're having to go further offshore to find sand. And, where the Army Corps of Engineers sees sand for beach replenishment, I see fish habitat.

Those mounds, the ridges -- those areas are what help make our fisheries as productive as they are, but also need to be protected.

Taxpayers pay the largest portion -- or, all of it, I guess, in one way or another -- of the cost of beach-nourishment projects, so, the general public often doesn't have meaningful access to those beaches. Inadequate parking; no restroom facilities available to them. In some towns, you can't bring food onto the beach, so, unless you live nearby, that becomes a restriction. And, you can see that in the patterns of use in the summertime. My family has a house in Belmar; very crowded, very diverse. Folks take the train down from North Jersey, from New York. Right next door, in Spring Lake, there's a lot more open sand, and mostly people who live there -- from just my casual observations.

So, we have a long way to go. Senator Smith sponsored the Public Trust Act several years ago, which was supposed to require the Department to assess public access each time they spent Federal money on those kinds of projects. I don't think those assessments have been done; I think that we have not met the need of sort of supporting infrastructure.

I get an alert on my phone every time Island Beach State Park closes, and every time Sandy Hook closes. And, on beautiful summer days, it happens multiple times a day. So, if you don't have the capacity in those two, big, long, barrier island beaches to support all the people who want to be there, then we're not providing adequate access to the shore to people -- for those projects that are paid for with public money.

There are a fair amount of design problems with them. The surfers often complain about the sharpness of the design. But, that's a little more easy to correct. I think the largest problem is that it continues to

support the over-development of the shoreline itself. We feel safe behind those beaches -- and, we are, to a certain extent. But, if we know there are hazardous areas, and we know the hazards are getting worse, maybe it's time to stop digging the hole and over-building the coastline as intensely as it has become developed since Sandy.

If you look at the demographics of that, the generational folks who had small homes were massively priced out of rebuilding after the storm. And, that's a whole other unfortunate -- sorry -- tale. But, that, partly, is brought about by the confidence that we feel being behind the nourished beaches.

So, I would just recommend that the use of a (indiscernible) as the primary long-term shoreline-management strategy is likely to be financially unsustainable in the long run. Senator Smith mentioned sort of the back and forth at the Federal level, support for this -- diminishing resources there, and that we should look to alternatives. I don't say that there won't be a need and an appropriate place for nourishment to happen, but there are opportunities to make the system -- the beach system -- function more naturally and, therefore, retain more sand into it.

We are right up against those engineered dunes. In fact, some of the buildings are in the dune, on the backside of it. There's no room -- the engineered dunes don't act like natural dunes, but we don't leave room for that system to function, and that's something we ought to change as we go forward.

So, I think the equity issue -- Who pays for their nourishment? Who gets the benefits? -- really needs to be looked at. And, this is like, completely anecdotal, my observations of being a beach bum for a while. But,

I always notice that after the time that the lifeguards go home and the beach fees are not being charged anymore, there are families of color who come onto the beach in a higher proportion than during the daytime. So, the fees -- the beach fees themselves, which absolutely have to be used to manage the beach -- but are getting to a level now that I think they're posing yet another barrier to access, and I think that's something that should be looked into very, very -- very hard.

Lastly, just on the PACT rules -- my summer reading -- I'm not through with all thousand pages of the thing yet, but I think, generally, it is-- It takes important steps. There are several long-time loopholes that have kept the State from regulating development appropriately that are being fixed. The stormwater changes are really going to foster responsible development. It will deal with the-- It will help to deal with the flooding. The tools of expanding the flood zones, having the inundation risk assessments -- those are all good tools. Requiring the resiliency planning as part of the stormwater element, and from the water quality perspective, tying in major developments into what are called TMDLs -- total maximum daily loads -- that's an attempt to set a pollution budget, in essence, for waters that are polluted and need to brought back to where they're clean that we can use them again.

So, I think, broadly, Senator Smith, you sort of asked what can we do -- and, we need to stop developing highly vulnerable areas. Now, we can build -- we can elevate another 5 feet in certain places. I think that's going to-- We're still going to get problems that are going to be remaining, but there are highly vulnerable areas that we still allow development to

happen in, and we ought to take steps to keep those people out of harm's way.

I am not an attorney, but somebody told me about the attorney rule, "moral hazard." We set our laws up and our zoning to encourage people to make their lives in places that are dangerous. I don't think that's an appropriate action for government -- at any level.

We need to restore the natural features. We have filled, over time, more than 50% of the natural base of tidal wetlands that existed when Europeans first got here. I heard a lot of discussion about the value of those wetlands, the role they can play. We're working now with the Army Corps of Engineers and others and folks who are working not directly with us but in parallel to tide the dredging of our channels together with marsh restoration; with beach nourishment; to beneficially reuse those sands and those sediments.

And, I think that that leads me to we need more planning, more risk-based plans. The plans that Nick's effort has pulled together under the Resilient NJ program are really good, and they're built by the communities. They're building lots of community participation, they reflect their priorities, but they really get to that place where you were asking, Senator, where is it we should be acting? Where should we be invested? And, you really can't get to that except through that type of planning. And, that planning needs lots of support.

And, then, lastly, I would hope that we would look back at a tool that we created 15 years ago. It was a State program for the transfer of development rights. I understand the equity issues in terms of property -- in terms of the impacts of property taxes. That tool, which has worked very

well in the Pinelands, was meant to help preserve some of that equity to the land owner when the ability to develop the land was restricted. And, I think that's a tool that we're going to have to use on the shoreline as the ocean inexorably advances forward. You don't want people to lose all that value, but have it, rather, used and invested in the right places.

So, I very much appreciate your efforts. I am more than happy to answer any questions you might have. I invite you out to build an oyster reef with me, if you like to come out and get wet and muddy, or come see horseshoe crabs in the springtime.

SENATOR SMITH: Are there any questions for Mr. Dillingham?

Yes, sir. Assemblyman.

ASSEMBLYMAN INGANAMORT: Thank you very much, Chairman.

Thank you, Tim, for that perspective. That was really compelling; I learned a lot.

And, I don't want to put you on the spot, but I want to delve a little deeper into some of the things you said about development over buildings, some of the sensitive areas, etc. And, I think any fulsome conversation on protecting the ecosystem of the shore really needs to include this issue of development.

MR. DILLINGHAM: Absolutely.

ASSEMBLYMAN INGANAMORT: You know, in the State of New Jersey, under the fourth round of affordable housing obligations, the obligation to develop in Ocean County alone is 6,799 new units. Six

thousand seven hundred ninety-nine new units in Ocean County, where we are today. Not Monmouth, Atlantic, Cape May, etc.

Earlier this year, the Legislature passed A4, Assembly Bill 4, that would actually increase that obligation -- increase the development obligation along the Jersey Shore. In Ocean County, it would rise to 7,711 units.

I'm not going to ask you to react to the wisdom of that -- though you're free to share -- I have my own perspective on it, particularly as a lawmaker who comes from the Highlands region. We're facing similar development obligations in an area where two-thirds of New Jerseyans get their drinking water.

Setting that aside for a second, are there strategies you would recommend to ensure that the 7,711 new housing units coming to Ocean County -- and, the thousands coming to the other counties along the shore -- is brought into this community and this ecosystem in a responsible way? How do we make it fit?

MR. DILLINGHAM: Well, I think that-- First, I would send you to my friends at New Jersey Future, and Peter Kasabach. I don't-- And, I am not a planner, I am not an urban developer, but, I have always been perplexed by the idea that we could not bring those units into center-based development. (indiscernible) the State plan, where it's supported by infrastructure, where we're recreating walkable communities.

I don't know what 7,000 units spread out across Ocean County looks like, in terms of changing the landscape. It sounds like a large number when you have municipal governments, which have an obligation to provide it, obviously. But, as an absolute overall number, it seems to me not unreasonable to think you could be accommodating. Except that the

approach -- and, that'll be way out of my wheelhouse -- but the approach seems to be to not bring affordable housing units into the community, except in rare circumstances. There was a proposal at one point to put affordable housing out on Sandy Hook; to re-utilize the park there for that kind of thing.

I think there are equity issues involved. I think there are probably historic questions about the diversity of our communities that people are trying to avoid. But, my sense of the talents and the thinking that people have put into smart growth is available to us. We have a lot of smart people at Rutgers on the science side; we have a lot of smart people about how to build communities that are oriented around transit; that bring in the density that we need to have day-to-day communication with folks to build that social sense of community.

And, I think if we can do that effectively-- So, it is, in a certain way, like the climate-change issue, in that it's tough to face up to it. And, spend-- My observation is we spend a lot of time trying to avoid figuring out how to make it work rather than tackling it and putting it to -- putting our skills to practice.

ASSEMBLYMAN INGANAMORT: Yes, I really appreciate that.

Again, I don't want to put you on the spot. You're not a planner; I'm not a planner, but, I do think that a development mandate along the shore needs to be part of this conversation.

I actually want to correct myself. When I say 7,700 units in Ocean County, it's potentially four times that amount. You know how affordable housing works: It's typically four market-rate units to the one

affordable unit. So, we're looking at, potentially, an enormous amount of development along the shore.

And, I just offer that perspective in a respectful way. I hope to strengthen the conversation; I sincerely want to be part of the solution here, and I think we need to keep that top of mind.

So, Tim, thank you very much; I really appreciate it.

MR. DILLINGHAM: You're welcome; thank you.

SENATOR SMITH: Any other questions for Tim?

SENATOR McKEON: I have a quick question for Tim.

SENATOR SMITH: Sir.

SENATOR McKEON: Well, the work that Senator Smith and I and the members of the Committee have done many years ago now, regarding the protecting the horseshoe crabs. Is Division of Gaming and Wildlife doing what they're supposed to do? I mean, I know there's a lot of ballyhoo now about a chemical way to produce the very vital blood that the horseshoe crabs have for medical testing, but what's going on?

MR. DILLINGHAM: Well, I think-- The legislation that you all authored with the Secretary of Agriculture was landmark, and it has been very effective on the New Jersey side of the bay. We have a moratorium on the taking of crabs for bait; there are record numbers of crabs in this curve that's going up.

So, I think that it's been effective that way. The biomedical take is still coastwide, almost a million crabs a year. The shorebirds, unfortunately, are still fluctuating the populations. The eggs on the beach themselves, the densities are still not where they should be if you benchmark it back against the 1980s.

So, the legislation was key; we're still trying to push the Atlantic City's Marine Fisheries Commission to not expand the harvest to female crabs. They need the eggs; the females lay the eggs. It just seems counterintuitive to us to expand that harvest. So, I think the habitats also need to be restored as one of the elements in that.

SENATOR McKEON: You mentioned that in your testimony before, and it made me think of it.

Thank you, Senator.

SENATOR SMITH: Thank you, Senator.

And, our last two witnesses of the day. They're coming up together; they both are with New Jersey Future.

Peter Kasabach, the Executive Director of New Jersey Future, and Lindsey Sigmund-Massih, who is Mainstreaming Green Infrastructure Program Manager at New Jersey Future.

Take it away.

P E T E R K A S A B A C H: All right, thank you very much.

And, we get to say good afternoon, and we're very happy to have this and to be here.

And, actually, very happy to follow Tim; always happy to follow Tim, who is a much better smart growth spokesman than he gives himself credit for. I think his answers were excellent. (laughter)

So, I am the Executive-- I am Pete Kasabach, the Executive Director of New Jersey Future. Many of you know New Jersey Future is a smart growth and sustainable development organization; we focus on policy and practice. We've been involved in climate change adaptation for over a dozen years now, at multiple levels, whether it's local or State level.

Really appreciate you guys having this hearing, and I'll echo that your leadership is imperative, and there's some great examples of it, and I'm glad that you actually recognize some of the great things that you've already done, where you've talked about stormwater utilities -- being able to authorize those, even though we're a little slow in this state to pick them up. The flood-disclosure law that you were able to get passed last year now means that tens of thousands of people who are going to be renting and buying homes now know the kind of risks that they're going to be facing. And, the requirement to have towns do the vulnerability assessments. All of these elements build up, and they build us towards planning better for the future. So, thank you very much for that.

What we're going to talk about today-- We were asked to talk about the New Jersey REAL rules. And, my colleague, Lindsey, will talk about that. And, then, we're going to talk about just a couple of considerations that we think we should be really paying attention to as we go forward, which I think will start to answer some of the questions about, "What do we do next?"

So, Lindsey.

L I N D S E Y S I G M U N D - M A S S I H: Great; thank you.

Good afternoon.

I am Lindsey Sigmund-Massih; I work with Pete at New Jersey Future, and I work on our stormwater policy and our climate-adaptation work.

I'm really happy to be here today, especially in my hometown of Toms River. It's very fitting that we're talking about flooding and other

climate-change-related issues that coastal communities -- especially Toms River -- are no stranger to.

So, like Pete said, I'm mainly going to talk about DEP's pending rule proposal, REAL -- Resilient Environment and Landscapes -- which falls under the NJ PACT rulemaking initiative, New Jersey Protecting Against Climate Threats.

As a smart-growth organization, we've been closely following DEP's rule changes to update their land-use requirements to incorporate the latest climate science to ensure that our new assets and our newly built and re-built infrastructure; our homes; and roadways are resilient to a changing climate.

So, this is -- as you heard a couple times -- this is a 1,000-page rule proposal, and mainly includes changes to our -- changes to how we develop in the coastal zone. It changes how we manage stormwater statewide and there are changes to wetlands requirements, and some other things you heard about that would better enable nature-based solutions like living shorelines.

So, like I said, REAL mainly impacts our coastal areas. And, you already heard a bit about REAL, but I want to highlight a few things that really rose to the top as we started to delve into this rule proposal.

So, REAL adjusts the extent of flood zones in New Jersey to account for rising sea levels and storm surge. So, it extends our flood-prone areas further inland to account for other areas in the state that are vulnerable to flooding, which will require higher first-floor elevations or flood proofing for buildings, and will require higher roadways. So, new homes that are built in the flood zone will be required to be -- the first floor to be 5 feet higher

compared to today's standards. It also creates an inundation risk zone -- which you heard a bit about -- which applies to areas at risk of permanent or daily flooding in the future, and requires this risk assessment to be submitted to the department through their regular permitting process -- again, to acknowledge the risk of building in these vulnerable areas.

REAL also strengthens our stormwater-management requirements statewide. This does not just apply to the coast. So, in our highly developed state, as you know, we have large areas of legacy impervious cover and existing development that were built long before we had today's strong stormwater-management requirements that require things like green infrastructure to manage stormwater; to improve water quality; and mitigate localized flooding. What REAL does is it requires water -- the same water-quality benefits for redeveloping sites as vacant or undeveloped sites. So, when a site that's already developed will be redesigned and redeveloped and impervious cover is replaced, those projects have to meet the same water-quality requirements as if it were a vacant site.

This is something that New Jersey Future and other organizations that are in this room today have been advocating for for years, so that was a really positive change that we saw make its way into REAL. The other requirements and clarifying language for developments to work with nature to protect our communities and natural resources -- so these changes will better enable living shorelines and other innovative restoration projects, which, today, sometimes take a long time to get approved, so REAL will help streamline the permitting process so we could see more innovative nature-based solutions like living shorelines.

We mention this -- we heard a bit about this today already -- but REAL represents a paradigm shift in how we think about development in flood-prone areas. You've heard that this proposal does not create a no-build zone, but the rules do, in a way, inform where we should be potentially incentivizing or disincentivizing development. For example, building in the coastal zone will now require additional engineering and could increase project costs, which could potentially disincentivize development in our most vulnerable areas.

Something we've heard from the development community over the years -- not just as it applies to REAL -- but the need for consistent development requirements. Something that groups have been advocating for for a long time is a consistent statewide sea-level rise standard. So, when you're going to develop in a flood-prone area, there are consistent standards. And, that's something that REAL accomplishes.

Overall, these are very significant changes, but we see them as positive changes. But, REAL is just one piece of New Jersey's climate-adaptation strategy. What about all of our existing development and vulnerabilities? Despite the rule change, we're still allowing homes and other assets to be constructed in areas that are susceptible to flooding and that are at risk of future permanent or daily flooding in the future.

So, there are still some questions remaining, and some issues that need to be addressed, so we're going to highlight a few that rose to the top for us.

One is the citing of affordable housing, which we were just talking about earlier. There are municipalities, especially in our coastal zone, that still need to meet their affordable-housing obligations, and now, as a

result of climate change and as a result of the REAL proposal, there may be fewer buildable locations that are safe from flooding. We don't want to put affordable housing in harm's way. And, there are areas identified in need of redevelopment, especially in urbanized areas, that are flood prone. So, what we need to do is get creative with how we redevelop non-flood-prone areas to meet our growing needs like affordable housing.

I'm a planner, so I'm going to talk a little bit about planning. So, today's infrastructure, as we know, is not built to withstand tomorrow's storms. So, to ensure longevity and safety of our most at-risk communities, we need to put climate-change models at the forefront of our local planning as well. Municipalities still need funding for their local climate-resilience planning. Although there's been a lot of work done to date, communities still need to inventory their assets like roadways, hospitals, and other critical facilities in relation to climate hazards. Raising homes -- like new homes, like REAL requires -- protects that one privately owned asset, but there is still the larger issue of existing low-lying roadways. What good is a raised home without protected adjacent infrastructure?

Something else that REAL requires related to planning: Climate resilience must now be incorporated in local stormwater-management plans to look at how rainfall; sea-level rise; other climate hazards will impact their stormwater infrastructure. So, now the State is requiring both climate-change vulnerability assessments with the land-use element that you mentioned earlier, Senator. But, now, there's currently no requirement to connect the two: the stormwater-management plans and the land-use element. So, this is a future opportunity to require those plans to be coordinated.

So, municipalities need more guidance and funding to ensure that these plans are well informed and complementary. We were excited to see DEP's recent announcement of a $72 million grant from NOAA, which will fund local climate-resilience planning, just underscoring that we should continue to identify funding to ensure that every municipality has the resources to complete this work.

I mentioned roadways a couple times in my testimony so far; I wanted to highlight something that REAL proposes. REAL includes exceptions for public transportation entities like NJDOT -- Department of Transportation. Our roadways contribute, as we know, significantly to flooding, but in REAL there are exceptions allowing relaxed stormwater management for transportation projects, which demonstrates a need for more coordination between state agencies like DEP and DOT. Agencies need to engage in complementary climate-resilience planning and project implementation.

We need to use every tool available to formulate a robust statewide climate-adaptation strategy. We should be exploring the creation of climate-adaptation tools that support managed retreat. Managed retreat is a controversial term that's being used more and more across our country's coastal communities. Broadly-- And, I want to explain a little bit more what I mean about managed retreat. Broadly, it means moving people, structure, and infrastructure out of harm's way before flooding and other disasters occur. But, we already do this in New Jersey -- as you heard earlier about New Jersey's Blue Acres Program. Blue Acres is a managed-retreat tool. The State buys out flood-prone properties and transforms them into open spaces. It's my understanding that most buyouts to date are for properties along our

rivers and streams, rather than our coastal areas, which are arguably more at risk; that's where sea-level rise meets increased rainfall meets storm surge.

So, some ideas are to increase State funding for this program. We could also fund local managed-retreat studies for high-risk coastal areas. The solution likely isn't a statewide one-size-fits-all managed-retreat strategy; it's most likely a hyper-local solution that includes solutions that acknowledge the communities and community ties that have been built in vulnerable areas. So, as we move forward with solidifying our climate-adaptation strategy, we must prioritize cooperation between state agencies, municipalities, and the private sector so that we may continue developing equitable solutions to the climate crisis.

SENATOR SMITH: So, I have to stop you--

MS. SIGMUND-MASSIH: Yes--

SENATOR SMITH: --just following up on the Assemblyman's comment. He said we need creativity to deal with the Constitutional obligation to provide an opportunity for low- and moderate-income housing in all the towns of our state, and we're going to have new numbers -- I think DCA is working on that now, so, new numbers are coming out.

What's the creativity? It sounds like we have a rock and a hard place here. If you're saying building in many coastal communities is putting low- and moderate-income people at risk, maybe we should think about another strategy that would mean higher numbers in other towns or in other areas that weren't vulnerable. I've got to believe the political implications of that are huge.

Give me an idea of where the creativity is going -- if you have it. If you don't, please send it to us, because we want to hear what it is.

MR. KASABACH: Well, I think where we can start with the creativity is starting with planning. What's happening with a lot of the municipalities is they're getting their numbers and then they're being reactive, and they're not thinking about how do these affordable-housing units fit into the fabric of the community. How do we create walkable, bikeable places while we're redeveloping and developing?

So, we need to do better planning, first of all. And, then, secondly, the issue of recognizing that there are some places that are going to be higher risk, and that's just not where we should be putting the affordable housing. The issue that you said-- There were some municipalities that may be largely at risk, and so how do we deal with those? We're not going to deal with those through an affordable-housing structure. We're going to have to deal with those through a planning structure that says there are certain towns that may be better off merging with each other so that we do end up having this--

SENATOR SMITH: That's going to be easy.

(laughter)

MR. KASABACH: None of these answers are easy. If you want the easy answers, you can go next door, I guess.

But, no, there are no easy answers, but--

SENATOR SMITH: But, when you have *any* answers, please forward them to us, because we would like to hear them.

MR. KASABACH: Sure.

SENATOR SMITH: And, I didn't mean to interrupt your testimony.

MR. KASABACH: No, that's fine.

SENATOR SMITH: Senator McKeon.

SENATOR McKEON: I'm so sorry to interrupt you even further, but we have at least one alternative, and you were good enough to put it on our agenda and get it out of community, or out of this Committee. And, quite frankly, that's to remove flood-prone areas out of the calculation for most communities. And, some that are housing advocates say, "Well, a town like Mantoloking, that means they don't have any obligation." Well, if that's it, so be it, because there's many other-- At the end of the day, unless something is strictly prohibited, you can rest assured there's going to be premises that are going to end up being built in flood -- at-risk areas -- and guess who, then, is going to be the unfortunate recipient of consequences of that.

MR. KASABACH: I agree; I think the challenge is still not to keep doing this piecemeal, but rather to look at it more holistically.

So, look at, in the example of Mantoloking. If Mantoloking-- If we're going to stop developing in Mantoloking period, then maybe there is an argument to be made for not doing affordable housing there. But, if there is going to continue to be development, redevelopment, we're going to keep investing there, then there's an equity issue.

So, it's just not an easy one, but--

SENATOR McKEON: We just have to be more broadminded to think, "Oh, you're against affordable housing if you're looking in that way." It's just the opposite -- very much committed to it, but we have to be practical.

MR. KASABACH: And, we really can't be pitting the two against each other; agreed.

I wanted to just hit a couple of specific recommendations or things--

SENATOR SMITH: Please--

MR. KASABACH: --for the Committee to consider.

The first is, New Jersey does not have climate-change adaptation measures or targets. So, when we talk about greenhouse-gas reduction, we set targets; we build our policies and our programs to getting to those targets. We don't have those for climate-change adaptation. We need to develop a set of climate-change adaptation targets, and then we can align our policies and investments behind those.

Secondly, and, this is something that this Committee, the Committees, have seen before, is a water center -- water-infrastructure center -- that is based in an academic institution that would allow us to start to dig deep or look at these different issues--

SENATOR SMITH: Senator Greenstein's bill.

MR. KASABACH: Senator Greenstein's bill, exactly.

So, we would love to see that move forward. That would make a big difference.

These next two relate back to the managed-retreat issue, which is we continue to put infrastructure in places that we know are going to be at risk in the future. We need to align our departments better with their infrastructure investments, behind these rules, behind these plans, so that we're putting investments in places where they will be effective and efficient over the long term.

The fourth item is about abandoning obsolete infrastructure. So, if you have a town and half the buildings get wiped out along a certain street,

and we recognize this street is going to be more and more at-risk over time, municipalities -- even if they wanted to retreat -- don't have the legal ability to abandon that infrastructure. So, combining our Blue Acres acquisition program with the legal ability to abandon infrastructure, strategically, is something that is going to require a law to do.

SENATOR SMITH: And, just FYI, in past years we've looked at legislation where we would give the State condemnation authority -- especially to acquire property that protects water supplies. Politically, a firestorm. The people of New Jersey -- at least so far -- have not been willing to give the State of New Jersey carte blanche on condemnation.

MR. KASABACH: In this case, it's not even giving it to the State -- it's actually giving the municipalities the authority to do it so that it's a local decision. But, they don't even have the authority to do it right now, so.

This fifth one is what Tim has mentioned also, which is the need for funding. We've all been sort of lucky here over the last few years with this big infusion of Federal money. It's been very helpful; it's been able to go to lots of different places. That spigot, as you've noticed, is being turned off. (laughter)

SENATOR SMITH: Not forever.

MR. KASABACH: And, so, we're going to need to come up with a New Jersey-dedicated source of funding for funding these kinds of projects, whether it's a bond; whether it's an insurance surcharge; whatever it may end up looking like, it's something that we now need to seriously consider going forward.

And, the last point is just keeping equity front and center as we create our policies and our implementations. Because there can be lots of

unintended consequences for these things for underserved communities, and our policies and practices should not make those situations worse and, in fact, should try and correct former harms.

SENATOR SMITH: Great.

So, before I ask if there's any questions -- this is, in fact, our last set of witnesses -- a whole bunch of very, very reputable and informative groups asked to be on the agenda today, and we had to respond back, "There ain't enough time."

So, any of the groups who wanted to get on the agenda, we're going to keep the record on this hearing open for two weeks. Send in your cards and letters. I'm going to ask Celia that anything that we get in from any of the speakers -- from any witnesses or groups that were not on the agenda today -- that they could share with both Committees so you get a chance to read what the point of views were, including BIA -- I see Ray in the back -- and New Jersey Power, which I think is Dave Pringle; the Shore Partnership; and, the list goes on. We'd be happy to hear what you say. The clock runs out at some point.

So, that being said, are there any questions for either Peter or Lindsey? (no response)

Then, let me thank everybody for coming today. You gave us a lot of really great ideas, and I think that's helpful.

Chairman, do you want to say anything?

ASSEMBLYMAN KENNEDY: No, I think you pretty much wrapped it up and everybody looks like they want to go home.

(laughter)

SENATOR SMITH: Have a great day, and a great weekend.

MR. KASABACH: Thank you.

MS. SIGMUND-MASSIH: Thank you.

(applause)

(**MEETING CONCLUDED)**