

Effective Scientific Engagement in Climate Resiliency Legislation

A Case Study: NJ Joint Committee Hearing on Beach Replenishment, Climate Resiliency, and PACT Regulations

August 1, 2024

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Published: February 2026

Executive Summary

This hearing represents an exemplary case of scientific testimony informing state climate policy. Three PhD scientists provided quantitative projections that directly support the pending NJ PACT REAL rules—a 1,000+ page regulatory proposal to update coastal development standards for sea-level rise.

Key Finding: The hearing demonstrates how academic researchers can translate complex climate science into actionable policy guidance while maintaining scientific rigor.

Hearing at a Glance

| Metric | Value |
|------------------------|------------------------------|
| Date | August 1, 2024 |
| Location | Toms River Municipal Complex |
| Committees | 2 (Senate and Assembly) |
| Total Speakers | 10 |
| PhD Scientists | 3 |
| Claims Analyzed | 35 |
| Evidence Grade: Strong | 94% |
| NJ-Specific Claims | 71% |

Overall Effectiveness Score: 78.5%

| Dimension | Score |
|------------------------|-------|
| Scientific Rigor | 96% |
| Local Relevance | 85% |
| Policy Specificity | 82% |
| Legislative Engagement | 51% |

Part I: Scientific Witnesses and Key Claims

Dr. Anthony J. Broccoli

Position: Distinguished Professor of Atmospheric Science, Rutgers University

Role: Faculty Advisor, NJ Climate Change Resource Center

Claims Made: 12

Temperature Findings

“Global temperature has risen approximately 2 degrees Fahrenheit since the late 19th century, rising more rapidly in recent decades.”

“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.”

“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.”

“Unusually warm months have been much more prevalent than unusually cold months—outnumbering them 48 to 0 since 1990.”

Sea-Level Rise Projections

“In Atlantic City, sea-levels have risen by more than 18 inches since records began in 1911.”

“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.”

“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... In a moderate emissions scenario, the likely range of sea-level rise in 2100 is expected to be 2.0 to 5.1 feet.”

“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.”

Hurricane Sandy Attribution

“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.”

Dr. Ning Lin

Position: Professor of Civil and Environmental Engineering, Princeton University

Expertise: Hurricane storm surge modeling

Claims Made: 3

Storm Surge Projections

“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.”

Note: This paper was published February 2012, months before Hurricane Sandy validated its projections.

Compound Hazards

“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.”

Dr. Thomas Herrington

Position: Associate Director, Urban Coast Institute, Monmouth University

Organization: American Shore and Beach Preservation Association

Claims Made: 3

Beach Nourishment Effectiveness

“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.” (*Referring to Hurricane Sandy*)

Economic Impact

“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.”

Part II: Government Witness Claims

Nick Angarone (DEP Chief Resilience Officer)

“As of 2019, New Jersey ranked third in the nation in claims paid by FEMA since 1978... with \$5.8 billion in total flood insurance claims.”

“Over 30% of claims from Ida originating outside of FEMA’s designated flood plains.”

“It is likely that sea-level rise will meet or exceed 2.1 feet by 2050.”

“A 50% chance that Atlantic City will experience flooding almost every day by 2100.”

“New Jersey is the third-fastest warming state in the nation.”

Lt. Dinan Amin (State Hazard Mitigation Officer)

“Recently, New Jersey’s experienced uncommon hazards such as a 1,000-year, six-hour rainfall total, and an Enhanced Fujita Scale EF3 tornado.”

“New Jersey’s coastal economy generates over \$60 billion per year.”

“The Mitigation Unit has obtained more than \$1.1 billion in Federal funding since Hurricane Sandy.”

Part III: Research Institution Claims

Kimberly McKenna (Stockton University Coastal Research Center)

“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.”

“Hurricane Sandy’s losses at the New Jersey Beach Profile Network locations were significant. We saw... losses of 14 million cubic yards of sediment just at our sites that we had monitored.”

“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.”

Lisa Auermuller (Rutgers MACH Consortium)

“5 feet of permanent inundation would mean... more than 123,000 residential properties and about \$27 billion in property value.”

Part IV: Policy Connections

Primary Policy Focus: NJ PACT REAL Rules

The hearing centered on the pending Resilient Environments and Landscapes (REAL) rule proposal—a 1,000+ page regulatory update.

| REAL Provision | Supporting Scientific Claim | Speaker |
|----------------------------------|--|----------------|
| 5 feet sea-level rise standard | “2.0 to 5.1 feet by 2100” | Dr. Broccoli |
| Climate-adjusted flood elevation | “30% of Ida claims outside FEMA zones” | Angarone |
| Inundation risk zone | “123,000 properties at 5ft inundation” | Auermuller |
| Nature-based solutions emphasis | “\$1.3B saved by beach nourishment” | Dr. Herrington |

Legislative Items Discussed

| Item | Type | Status |
|------------------------------|--------------------|-------------------|
| NJ PACT REAL Rules | Pending regulation | Under development |
| Inland Flood Protection Rule | Existing law | Adopted 2023 |
| Flood Disclosure Law | Existing law | Active |
| Blue Acres Program | Active program | 1,100+ buyouts |
| Shore Protection Fund | Existing (1992) | \$25M/year |
| NOAA Award (\$72M) | New funding | July 2024 |

Recommendations Made

1. **Statewide Bond Issue** (Sen. Smith) — Dedicated funding for flood mitigation
2. **Water Infrastructure Center** (Kasabach) — Per Sen. Greenstein’s bill
3. **Climate Adaptation Targets** (Kasabach) — Similar to GHG reduction targets
4. **Managed Retreat Tools** (Sigmund-Massih) — Expand Blue Acres
5. **Shore Protection Fund Increase** (Dr. Herrington) — To \$50M/year

Part V: Committee Engagement Analysis

Questions Directed to Witnesses

| Witness | Questions | Topics |
|------------------|-----------|--------------------------------------|
| Nick Angarone | 3 | Sea level certainty, PACT progress |
| Dr. Broccoli | 2 | Practical adaptation, shore guidance |
| Dr. Lin | 1 | State agency coordination |
| Kimberly McKenna | 2 | Priorities, engineered dunes |

Notable Exchange

Assemblyman Inganamort to Angarone: > “I have to ask the question: What level of certainty do you have—what level of probability, from a statistical sense—in these projections?”

Angarone deferred to scientists, explaining “likely range” methodology and why policy should not be based on a “coin flip.”

Senator Smith to Dr. Broccoli: > “How much trouble are we in?”

Broccoli provided measured response: adaptation is necessary regardless of emissions policy because “there is more climate change in the pipeline.”

Part VI: What Made This Testimony Effective

Successful Strategies

1. **NJ-Specific Data** — Witnesses led with local findings (Atlantic City, Sandy Hook) before national context
2. **Quantified Uncertainty** — “Likely range,” “two-in-three chance” framing respected by legislators
3. **Economic Framing** — \$5.8B FEMA claims, \$1.3B Sandy savings, \$27B property exposure
4. **Institutional Credibility** — Rutgers, Princeton, Stockton research centers provided trusted sources
5. **Living Proof** — Hurricane Sandy served as undeniable validation of projections
6. **Coordinated Testimony** — Multiple witnesses reinforced same 2.1ft/5.1ft projections

Opportunities for Improvement

1. **Unified Document** — No single summary brief for legislators
 2. **Visual Aids** — Senator Smith displayed NOAA maps; others noted FloodMapper not shown
 3. **Follow-Up Protocol** — Several “send us that information” requests required tracking
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Part VII: Quantitative Summary

Claims by Category

| Category | Count |
|---------------|-------|
| Economic | 8 |
| Temperature | 7 |
| Projections | 7 |
| Storms | 5 |
| Sea Level | 5 |
| Precipitation | 3 |

Claims by Geographic Relevance

| Scope | Count | Percent |
|-----------|-------|---------|
| Direct NJ | 25 | 71% |
| Regional | 6 | 17% |
| National | 2 | 6% |
| Global | 2 | 6% |

Evidence Strength

| Grade | Count | Percent |
|----------|-------|---------|
| Strong | 33 | 94% |
| Moderate | 2 | 6% |

Appendix: Source Materials

Primary Source: Public hearing transcript (86 pages)

File: senaen08012024.pdf

Date: August 1, 2024

Location: Toms River Municipal Complex, Toms River, NJ

Publisher: NJ Legislature Public Hearings Archive

URL: <https://pub.njleg.state.nj.us/publications/public-hearings/24/senaen08012024.pdf>

Key External Sources Cited in Testimony

1. **Rutgers Scientific and Technical Advisory Panel** — NJ sea-level rise projections
2. **NJ Climate Change Resource Center** — State of the Climate 2023
3. **Nature Climate Change (Feb 2012)** — Lin et al. storm surge paper

4. **NOAA Tide Gauges** — Atlantic City, Sandy Hook records
 5. **NJ Beach Profile Network** — 171 sites, 1986-present
 6. **FEMA NFIP** — National Flood Insurance Program claims
 7. **U.S. Army Corps of Engineers** — Sandy damage avoidance estimates
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Analysis by Shannon Erwin
February 2026