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2015 New Jersey Sustainability Summit

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2016 NEW JERSEY SUSTAINABILITY SUMMIT

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Call to Order

Richard Dovey
Chairperson
Sustainable Jersey
Board of Trustees

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2016 NEW JERSEY SUSTAINABILITY SUMMIT

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Welcome

Dr. Barbara Gitenstein
President,
The College of New Jersey

2016 NEW JERSEY SUSTAINABILITY SUMMIT

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Sustainable Jersey Update

Donna Drewes
Co-Director,
Sustainable Jersey &
Sustainability Institute @
TCNJ

2016 NEW JERSEY SUSTAINABILITY SUMMIT

What is Sustainable Jersey?

Sustainable Jersey coordinates priorities, resources, and policy among public and private, state and local actors to help communities achieve their sustainability goals. Capped by prestigious certification, the program has three components.

Sustainable Jersey:

- Identifies **actions** to help municipalities and schools become more sustainable
- Provides **tools, resources, and guidance** to make progress
- Provides access to **grants and funding** for municipalities and schools

Sustainable Jersey Communities

Participating Communities

- Program launch: February 2009
- 437(78%) NJ municipalities participating
- 88% of NJ's population lives in these communities
- In 2015- 193 municipalities certified:
  - 160 towns at bronze level
  - 33 towns at silver level
- June 2016 - 111municipalities applied for certification (26 new)

Municipal Program Milestones

- 2015- 40 Bronze and 10 Silver Certified towns
- 39 workshops and webinars attended by over 2,100 individuals
- 19 Outreach events attended by over 4,450 individuals
- Task Forces developed new actions related to Public Information and Community Engagement, Emergency Management, Resiliency and Emergency Response

Sustainable Jersey for Schools

October 2014 Launch

SUSTAINABLE JERSEY CERTIFIED SCHOOLS

54 BRONZE

5 SILVER

59 CURRENTLY CERTIFIED

BECOME CERTIFIED →

Today

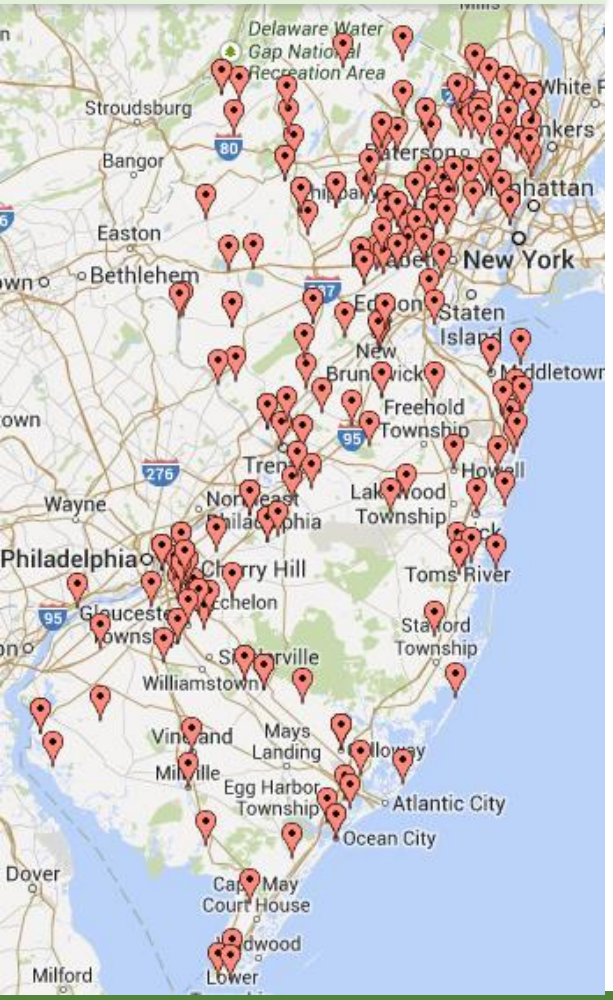
- **193** School Districts Registered
- **472** Individual Schools Registered

School Program Milestones

- First Awards Ceremony at NJSBA Workshop
- Second Certification Cycle- over 100+ schools have applied
- 29 workshops, conferences and training sessions attended by over 5,000 individuals
- Strong presence at NJ School Boards Association and NJ Education Association Conferences and workshops
- Task Forces developing new actions related to School Culture and Climate and Energy Conservation

Small Grants Program

Grant Award Locations



Since 2009 Sustainable Jersey has awarded 433+ grants ranging from $1,000 capacity building grants to $35,000 project grants.

By April 2016, over $**2,663,000** will have been awarded.

Funding Provided By:

- PSEG Foundation
- New Jersey Department of Health
- Gardinier Environmental Fund
- New Jersey Education Association

Program Benefits

- Environmental Defense Fund Fellows Program Supported by NJ Natural Gas
  - 3 EDF Climate Corp Fellows will provide technical assistance to 3 townships and 5 school districts this summer to advance their energy initiatives
- Power Save Schools Program Supported by NJ Natural Gas
  - 14 Schools in NJNG service territory received energy conservation education and training through the Alliance to Save Energy's Power Save Schools program. 22 Schools will be supported in 2016-17 school year
- Education for Sustainability Curriculum Writing Provided in Partnership with Cloud Institute and GR Dodge
  - 9 schools will bring 34 teaching staff to a week long curriculum writing workshop at Duke Farms

Strategic Initiatives

- Building Capacity in Communities through Regional Hubs
- Strengthening Community Resiliency
- New Program Actions: Going Beyond Low Hanging Fruit in Key Areas
- Building the Movement: Nationally and Internationally

Regional Hubs

- **Purpose of regional hubs**
  - Increase in **collaborations** among Green Teams within the region & across the state
  - Robust **network of leaders** learning successful models from each other
- **Resource for members**
  - **Quarterly events** bring expert speakers, training & updates on Sustainable Jersey actions, and an opportunity to socialize
  - Stay connected via **online communications platform** that fosters sharing & collaboration
  - Sustainable Jersey provides **technical assistance** & limited **administrative support**

Current Hubs

- Atlantic-Cape May
- Camden-Burlington-Gloucester
- Essex
- Mercer
- Monmouth
- Somerset
- *New in 2016*
  - *Middlesex*
  - *Hunterdon*

Resiliency Program

"To help municipalities strengthen their resiliency to the impacts of climate change."

- Research and Analysis
- Develop New Tools, Resources and Standards
- Outreach and Education
- Municipal Technical Assistance
- Monitor and Track Municipal Progress
- Network and Collaboration with Partners

Resiliency Program

Program Highlights

- Partnered with NJDEP, the National Wildlife Federation, Stevens Institute of Technology and others to assist communities with natural and nature-based strategies to mitigate flooding.
- Led state efforts in the development of the Coastal Vulnerability Assessment, a new tool for NJ municipalities (and upcoming action)
- Facilitated Getting to Resilience and Coastal Vulnerability Assessments in 12 municipalities, and another 15 are in the works.
- Supported development of a new program of resiliency actions.

New Actions: Prosperity, Planet, People

PROSPERITY

ENERGY EFFICIENCY	POINTS
Energy Audits for Municipal Facilities*	20-50
High Efficiency Municipal Buildings	10-20
FOOD	
Farmland Preservation	10 each
Food Production	10 each
Planning for Local Food Production	10 each
Support Local Food	10 each
LOCAL ECONOMIES	
Buy Local Programs	10 each
Green Business Recognition Program	10

PLANET

GREEN DESIGN	POINTS
Green Building Policy/Resolution	5
Green Building Training	5
Green Design Commercial and Residential Buildings	5-20
Green Design Municipal Buildings	10-20
GREENHOUSE GAS	
Municipal Carbon Footprint*	10
Community Carbon Footprint	10
Climate Action Plan	10
Wind Ordinance	10
INNOVATIVE DEMONSTRATION PROJECTS	
Geothermal	10
Green Roofs	10
Raingardens	10
Solar	10
Wind	10
Other	10
LAND USE & TRANSPORTATION	
Sustainable Land Use Pledge*	10
Complete Streets Program	20
Municipal Planning & Zoning Self-Assessment	10
Sustainability Master Plan Revision	20
NATURAL RESOURCES	
Natural Resource Inventory*	20
Water Conservation Ordinance*	20
Conservation Easements	10-15
Environmental Commission	10

PEOPLE

- Public Information & Engagement
  - Municipal Communications
  - Public Engagement (Govt. & Planning)
  - Online Municipal Public Service Systems
  - Open Data and Digital Information

- Emergency Management-
  - Ready Set Go Fire Company
  - Fire Wise Community
  - Community Wildfire Protection Plan
  - Extreme Temperature Plan
  - Emergency Communications Planning
  - Vulnerable Populations Identification

Building the Movement

National Network Report

Local Government Participation

Building the Movement

- Supporting other statewide sustainability programs
  - **Connecticut** working with the Conference of Mayors and Institute for Sustainable Energy at Eastern Connecticut State University to create new program
  - **New York State** – in partnership with Pace University Landuse Law Center

- Supporting International efforts
  - **Clean Air Asia Program** in partnership with the US Environmental Protection Agency- Office of International & Tribal Affairs seeking assistance in establishing a certification program for cities across Asia to address air quality

Celebrate Accomplishments

- Thank partners, state agencies, nonprofits, businesses, community and schools for your contributions and support
- Thank Sustainable Jersey Board of Directors for their leadership in guiding the program
- Thank Sponsors for providing the financial support needed to keep this program growing

Municipal Sponsors

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New Jersey Natural Gas

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NJM Insurance Group

Silver Sponsors

BAYSHORE Your recycling solution.

Bronze Sponsors

COVANTA Powering Today. Protecting Tomorrow.

EnergySolve avidxchange

investors Bank

SolarCity

Jersey Central Power & Light A FirstEnergy Company

GovPilot™

Schools Sponsors

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Sustainable Jersey for Schools Small Grants Program Underwriters

Founding Sponsors

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Keynote Address

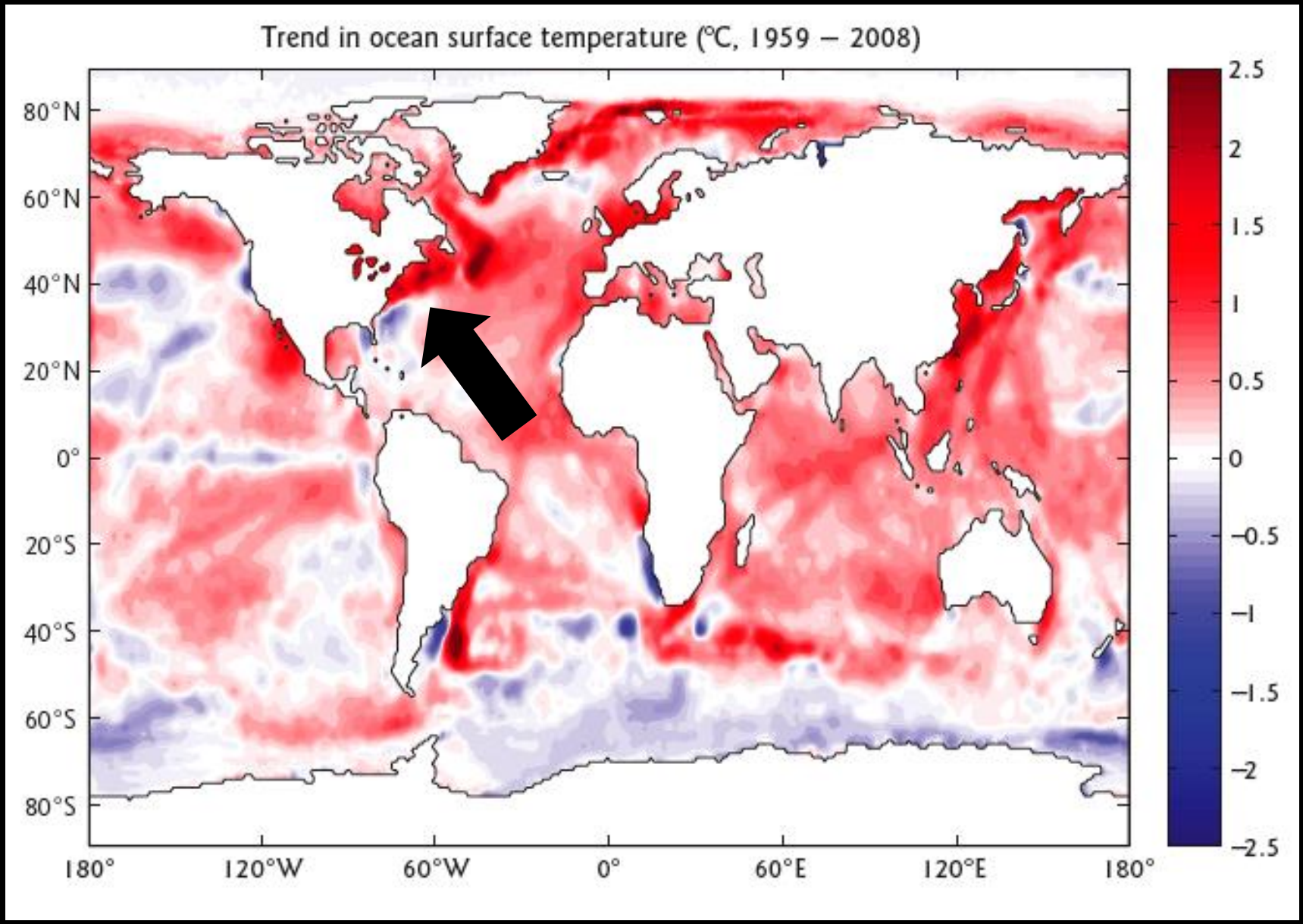
Dr. Benjamin Strauss

Vice President Sea Level and Climate Impacts
Climate Central

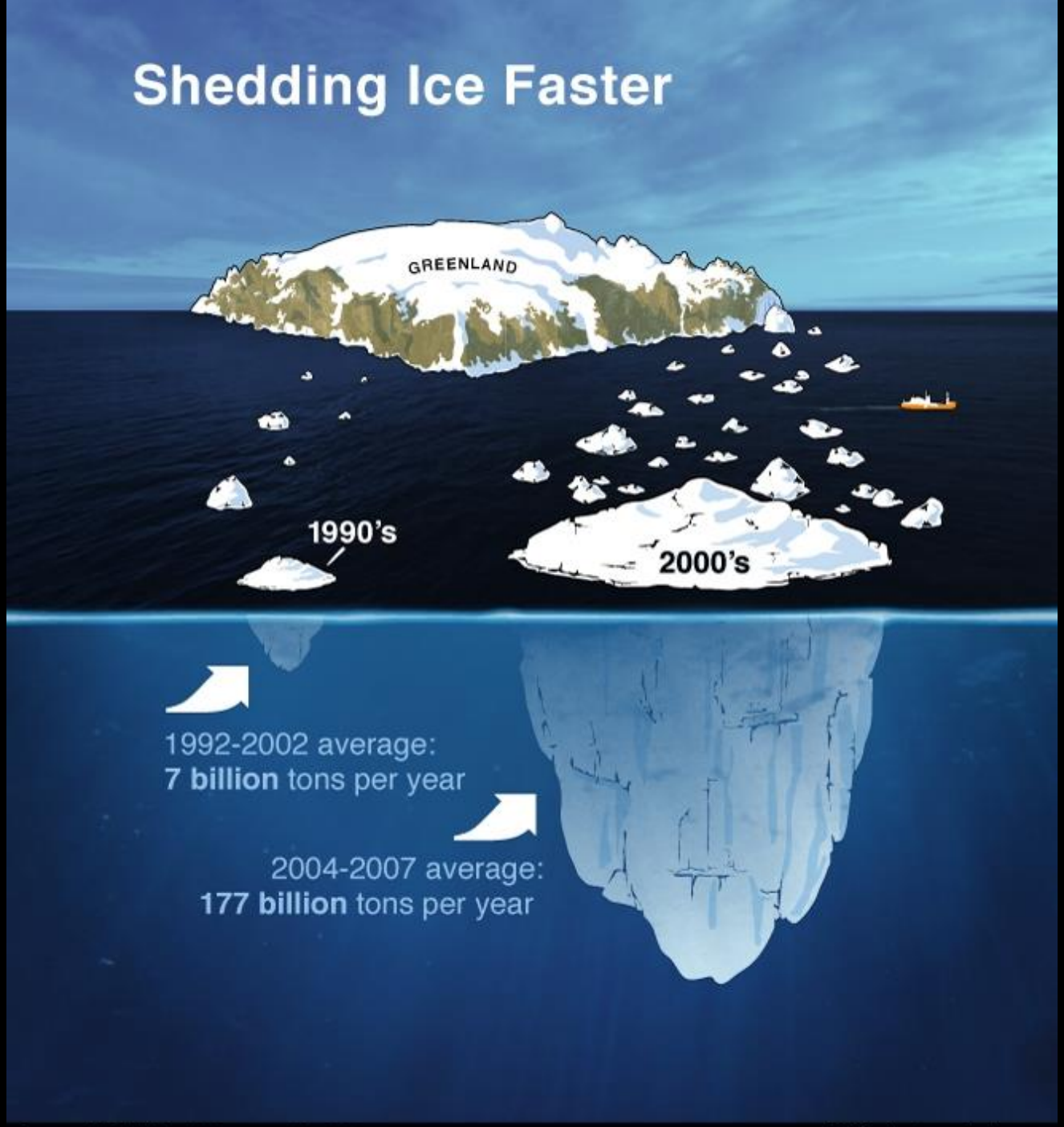
2016 NEW JERSEY SUSTAINABILITY SUMMIT

New Jersey Sea Levels: Past, Present & Future

Ben Strauss - Climate Central - June 15, 2016



Credit: Copenhagen Diagnosis 2009


Shedding Ice Faster
GREENLAND
1990's
2000's
1992-2002 average:
7 billion tons per year
2004-2007 average:
177 billion tons per year
Source: NASA | More info: www.get2.cc/67
climatecentral.org

PNAS PLUS

Temperature-driven global sea-level variability in the Common Era

Robert E. Kopp[a,b,c,1], Andrew C. Kemp[d], Klaus Bittermann[e], Benjamin P. Horton[b,f,g,h], Jeffrey P. Donnelly[i], W. Roland Gehrels[j], Carling C. Hay[a,b,k], Jerry X. Mitrovica[k], Eric D. Morrow[a,b], and Stefan Rahmstorf[e]

[a]Department of Earth & Planetary Sciences, Rutgers University, Piscataway, NJ 08854; [b]Institute of Earth, Ocean & Atmospheric Sciences, Rutgers University, New Brunswick, NJ 08901; [c]Rutgers Energy Institute, Rutgers University, New Brunswick, NJ 08901; [d]Department of Earth & Ocean Sciences, Tufts University, Medford, MA 02115; [e]Earth System Analysis, Potsdam Institute for Climate Impact Research, 14473 Potsdam, Germany; [f]Sea-Level Research, Department of Marine & Coastal Sciences, Rutgers University, New Brunswick, NJ 08901; [g]Earth Observatory of Singapore, Nanyang Technological University, Singapore 639798; [h]Asian School of the Environment, Nanyang Technological University, Singapore 639798; [i]Department of Geology and Geophysics, Woods Hole Oceanographic Institution, Woods Hole, MA 02543; [j]Environment Department, University of York, York YO10 5NG, United Kingdom; and [k]Department of Earth & Planetary Sciences, Harvard University, Cambridge, MA 02138

Edited by Anny Cazenave, Centre National d'Etudes Spatiales, Toulouse, France, and approved January 4, 2016 (received for review August 27, 2015)

We assess the relationship between temperature and global sea-level (GSL) variability over the Common Era through a statistical metaanalysis of proxy relative sea-level reconstructions and tide-gauge data. GSL rose at 0.1 ± 0.1 mm/y (2σ) over 0–700 CE. A GSL fall of 0.2 ± 0.2 mm/y over 1000–1400 CE is associated with ~0.2 °C global mean cooling. A significant GSL acceleration began in the 19th century and yielded a 20th century rise that is extremely likely (probability $P \geq 0.95$) faster than during any of the previous 27 centuries. A semiempirical model calibrated against the GSL reconstruction indicates that, in the absence of anthropogenic climate change, it is extremely likely ($P = 0.95$) that 20th century GSL would have risen by less than 51% of the observed 13.8 ± 1.5 cm. The new semiempirical model largely reconciles previous differences between semiempirical 21st century GSL projections and the process model-based projections summarized in the Intergovernmental Panel on Climate Change's Fifth Assessment

that are confined to smaller regions. The RSL field $f(\mathbf{x}, t)$ is represented as the sum of three components, each with a Gaussian process (GP) prior (15),

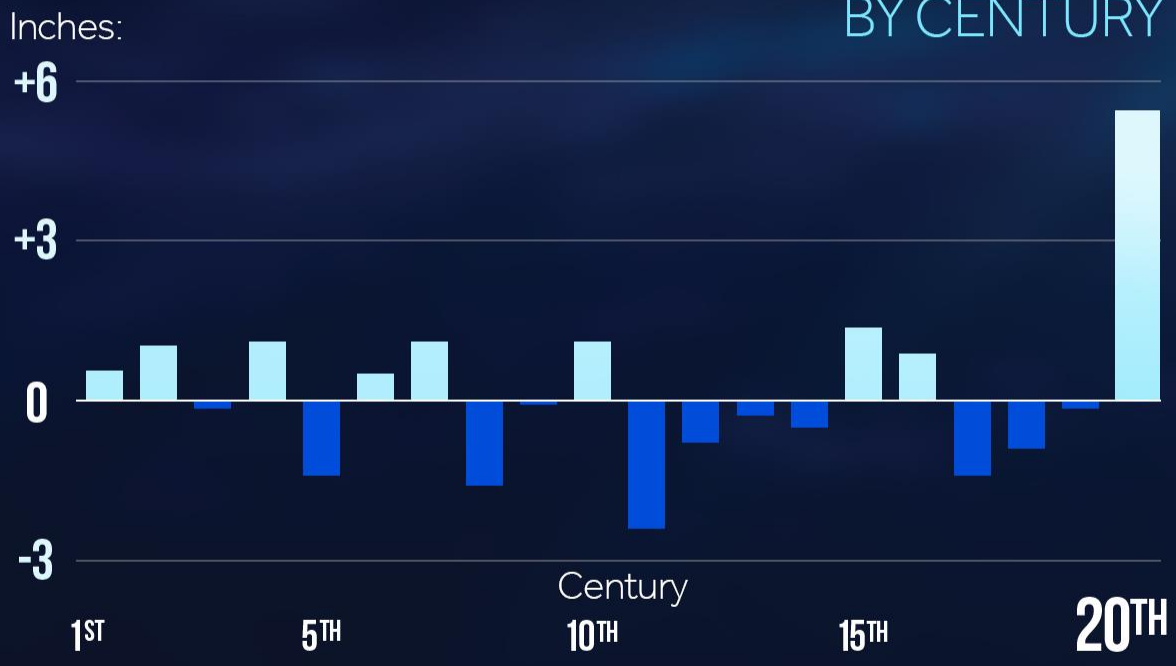
$$f(\mathbf{x},t) = g(t) + l(\mathbf{x})(t - t_0) + m(\mathbf{x},t). \quad [1]$$

Here, $\mathbf{x}$ represents spatial location, t represents time, and t_0 is a reference time point (2000 CE). The three components are (*i*) GSL $g(t)$, which is common across all sites and primarily represents contributions from thermal expansion and changing land ice volume; (*ii*) a regionally varying, temporally linear field $l(\mathbf{x})(t - t_0)$, which represents slowly changing processes such as GIA, tectonics, and natural sediment compaction; and (*iii*) a regionally varying, temporally nonlinear field $m(\mathbf{x}, t)$, which primarily represents factors such as ocean/atmosphere dynamics

SUSTAINABILITY SCIENCE

SEA LEVEL RISE

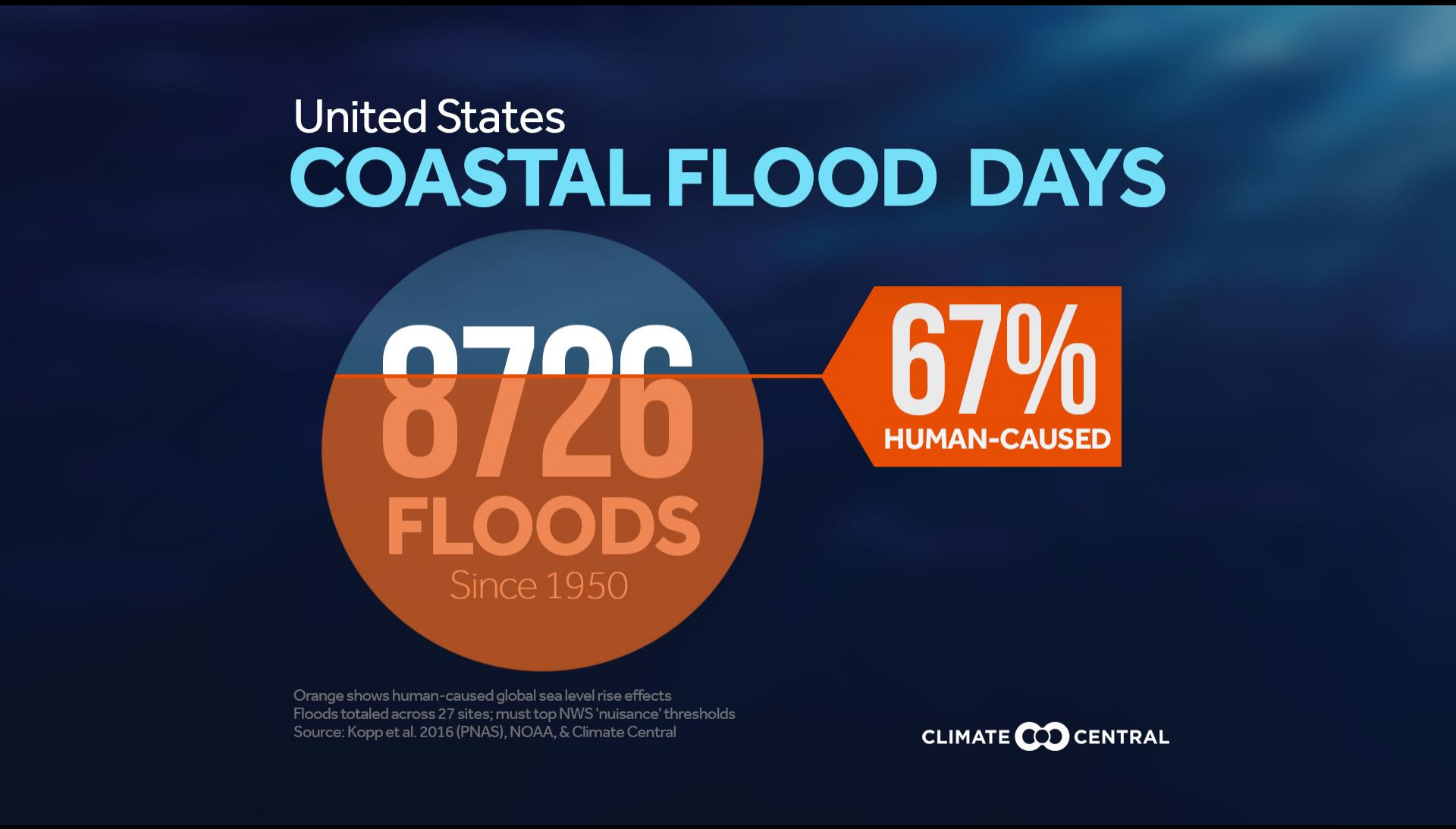
BY CENTURY

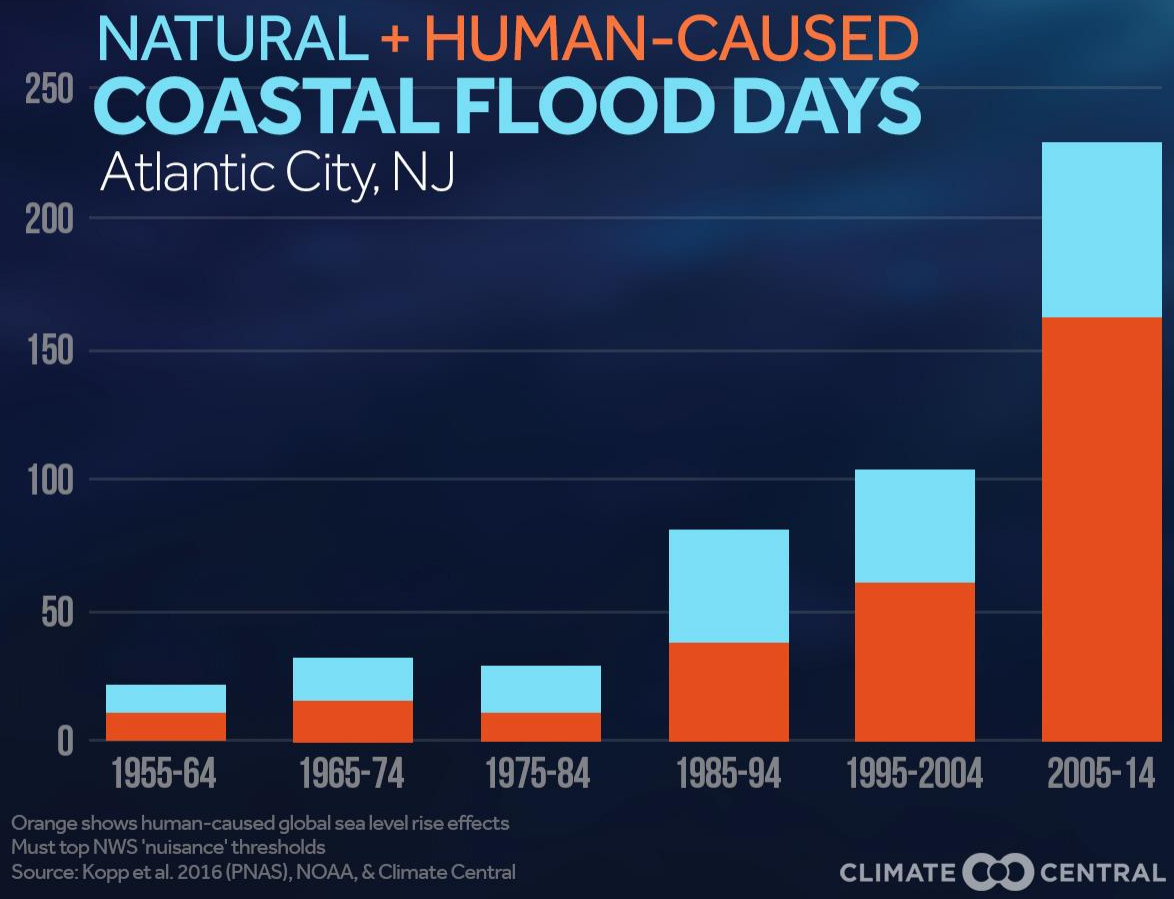


Central reconstruction shown
Source: Kopp et al. 2016 (PNAS)

CLIMATE CENTRAL


Andrew Hink


United States
COASTAL FLOOD DAYS
8726
FLOODS
Since 1950
67%
HUMAN-CAUSED
Orange shows human-caused global sea level rise effects
Floods totaled across 27 sites; must top NWS 'nuisance' thresholds
Source: Kopp et al. 2016 (PNAS), NOAA, & Climate Central
CLIMATE CENTRAL



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"All the News That's Fit to Print"

The New York Times

Late Edition
Today, mostly cloudy, late-day rain, high 40. **Tonight,** cloudy, some rain mixing with snow, low 34. **Tomorrow,** mainly cloudy, rainy, high 48. Weather map appears on Page C8.

VOL. CLXV . . . No. 57,151 NEW YORK, TUESDAY, FEBRUARY 23, 2016 $2.50

Flint Outbreak Was Treated With Silence

Officials Slow to Act in Legionnaires' Cases

By ABBY GOODNOUGH

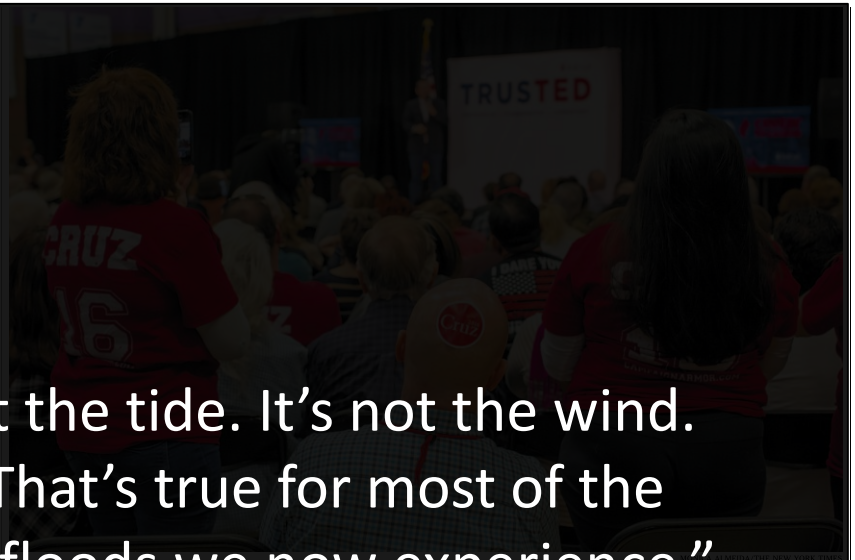
FLINT, Mich. — It was the Fourth of July, a warm summer night in 2014, but Tim Monahan was shivering in a thick blanket as he watched fireworks from his front yard here. By the next afternoon his temperature had shot to 104.6, and doctors at the hospital he had checked into puzzled over what was wrong.

[illegible] they had an [illegible] virulent [illegible] caused by a type of bacteria that can multiply in water systems. Mr. Monahan, now 58, was [illegible] at the leading edge of a Legionnaires' outbreak that sickened at least 87 people in the Flint region, [illegible] cannot conclusively link the outbreak to Flint's contaminated water supply, partly because sputum cultures were not collected from patients. But the possibility of a link was raised in internal government emails as early as October 2014, and state officials did not inform the public of the outbreak until last month.

The Legionnaires' cases started popping up as Flint residents were complaining about the foul-smelling, discolored water flowing into their homes after the city switched to a new water source, the Flint River, in April 2014. Soon they were reporting rashes and stomach ailments, and whistle-blowers eventually pointed to alarming levels of lead in the water supply and in children's blood.

An examination of government

Continued on Page A14



"It's not the tide. It's not the wind. It's us. That's true for most of the coastal floods we now experience."

ALMEIDA/THE NEW YORK TIMES

[illegible]ke-up in his campaign.

Russia Wants Closer Look From Above the U.S.

A Simmering Dispute Over Spy Missions

By ERIC SCHMITT and MICHAEL R. GORDON

WASHINGTON — Russia asked on Monday to fly surveillance planes equipped with high-powered digital cameras over the United States, fueling a long-simmering debate among Pentagon and intelligence officials over Russia's intentions to use such flights to spy on American power plants, communications networks and other critical infrastructure.

Russia has for years conducted unarmed observation flights over the United States — as the United States does over Russia — as part of the Open Skies Treaty that was signed in 1992 by both nations and 32 other countries at the end of the Cold War, and entered into force a decade later. Although the treaty and the flights, unfamiliar to most Americans, amount to officially sanctioned spying, their goal has been to foster transparency about military activity and to reduce the risk of war and miscalculation, especially in Europe.

Now some senior American intelligence and military officials say the new digital technology combined with shifting Russian flight plans would violate the spirit of the treaty. Some Republicans also expressed alarm.

"I cannot see why the United States would allow Russia to fly a surveillance plane with an advanced sensor over the United States to collect intelligence," Representative Mac Thornberry, a Texas Republican who heads the House Armed Services Committee, said in a statement on Monday.

American intelligence officials say Russia's spy satellite net-

Continued on Page A10

Cruz Takes Hit And Fires Aide For Rubio Clip

By MATT FLEGENHEIMER and NICK CORASANITI

Senator Ted Cruz's presidential campaign erupted in turmoil on Monday as Mr. Cruz fired his chief spokesman for spreading a misleading video of Senator Marco Rubio — an ill-timed shake-up for a campaign already under duress on the eve of the Republican caucuses in Nevada.

For Mr. Cruz, who has vigorously defended himself in recent weeks as rivals accused him of running an underhanded race, the episode cuts at the premise of his bid. He has cast himself as the candidate of honesty and integrity, with a faith-based pitch and a backdrop that reads "TrusTed" during speeches.

On Monday, amid persistent sniping from Mr. Rubio and Donald J. Trump about the Cruz campaign's penchant to mislead, the Texas senator was at last forced to acknowledge his team had gone too far.

At issue was a video of a hotel

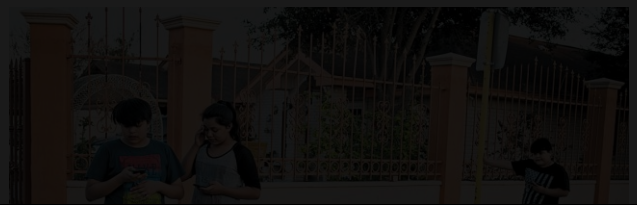
Continued on Page A19

Bridging a Digital Divide That Is Leaving Schoolchildren Behind

By CECILIA KANG

McALLEN, Tex. — At 7 p.m. on a recent Wednesday, Isabella and Tony Ruiz were standing in their usual homework spot, on a crumbling sidewalk across the street from the elementary school nearest to their home.

"I got it. I'm going to download," Isabella said to her brother Tony as they connected to the school's wireless hot spot and watched her



GREENHOUSE GAS LINKED TO FLOODS ALONG U.S. COASTS

A REACTION TO WARMING

Research Team Reports Fastest Sea Rise in 28 Centuries

By JUSTIN GILLIS

The worsening of tidal flooding in American coastal communities is largely a consequence of greenhouse gases from human activity, and the problem will grow far worse in coming decades, scientists reported Monday.

Those emissions, primarily from the burning of fossil fuels, are causing the ocean to rise at the fastest rate since at least the founding of ancient Rome, the scientists said. They added that in the absence of human emissions, the ocean surface would be rising less rapidly and might even be falling.

The increasingly routine tidal flooding is making life miserable in places like Miami Beach, Charleston, S.C., and Norfolk, Va., even on sunny days.

Though these types of floods often produce only a foot or two of standing saltwater, they are straining life in many towns by killing lawns and trees, blocking neighborhood streets and clogging storm drains, polluting supplies of freshwater and sometimes stranding entire island communities for hours by overtopping the roads that tie them to the mainland.

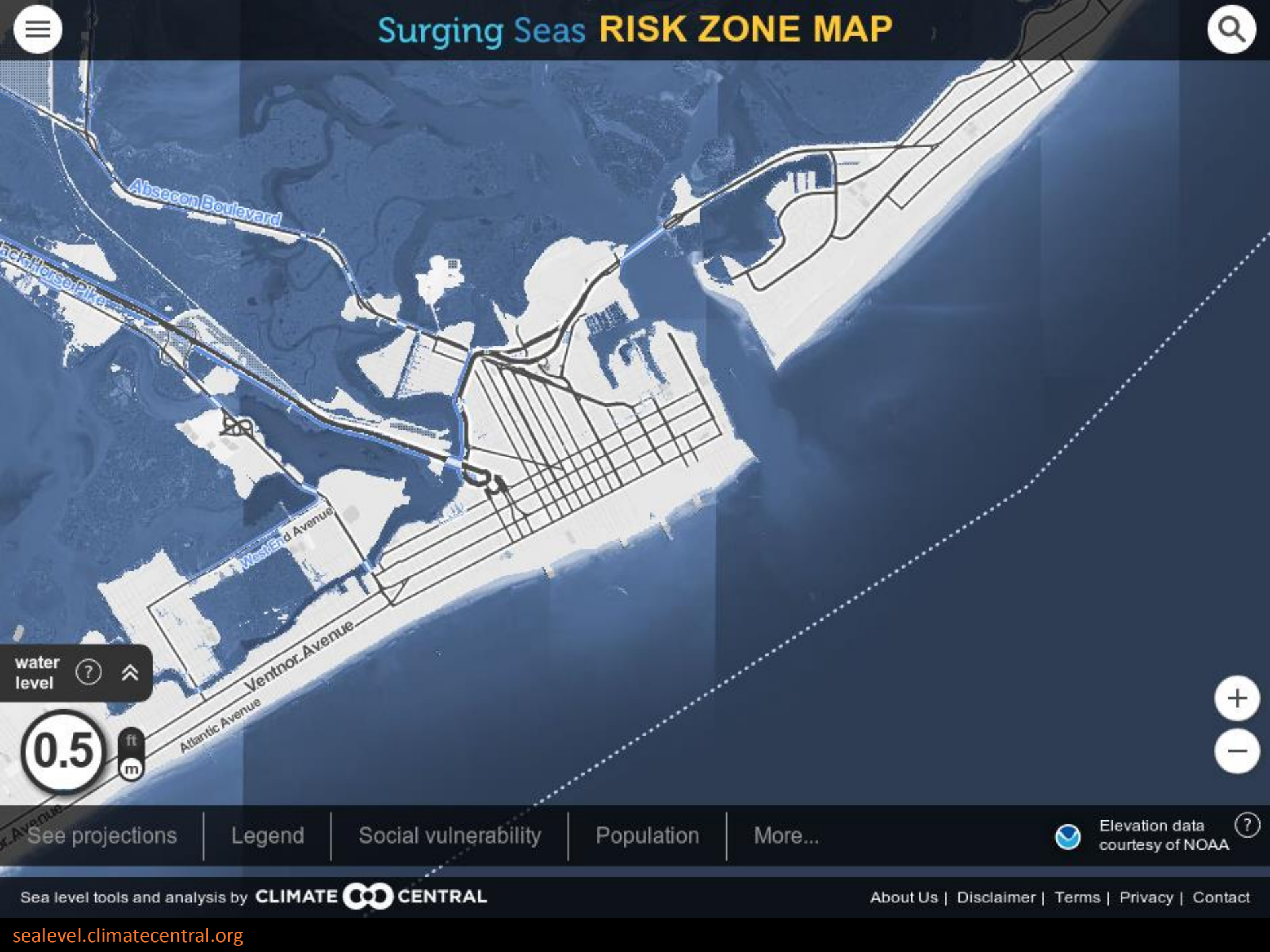
Such events are just an early harbinger of the coming damage, the new research suggests.

"I think we need a new way to think about most coastal flooding," said Benjamin H. Strauss,

Continued on Page A10

STEPHEN B. MORTON/ASSOCIATED PRESS

A street last year in Charleston, S.C., where flooding is increasingly routine.


Surging Seas RISK ZONE MAP
Absecon Boulevard
Black Horse Pike
Westend Avenue
Ventnor Avenue
Atlantic Avenue
water level
0.5
ft
m
See projections
Legend
Social vulnerability
Population
More...
Elevation data courtesy of NOAA
Sea level tools and analysis by CLIMATE CENTRAL
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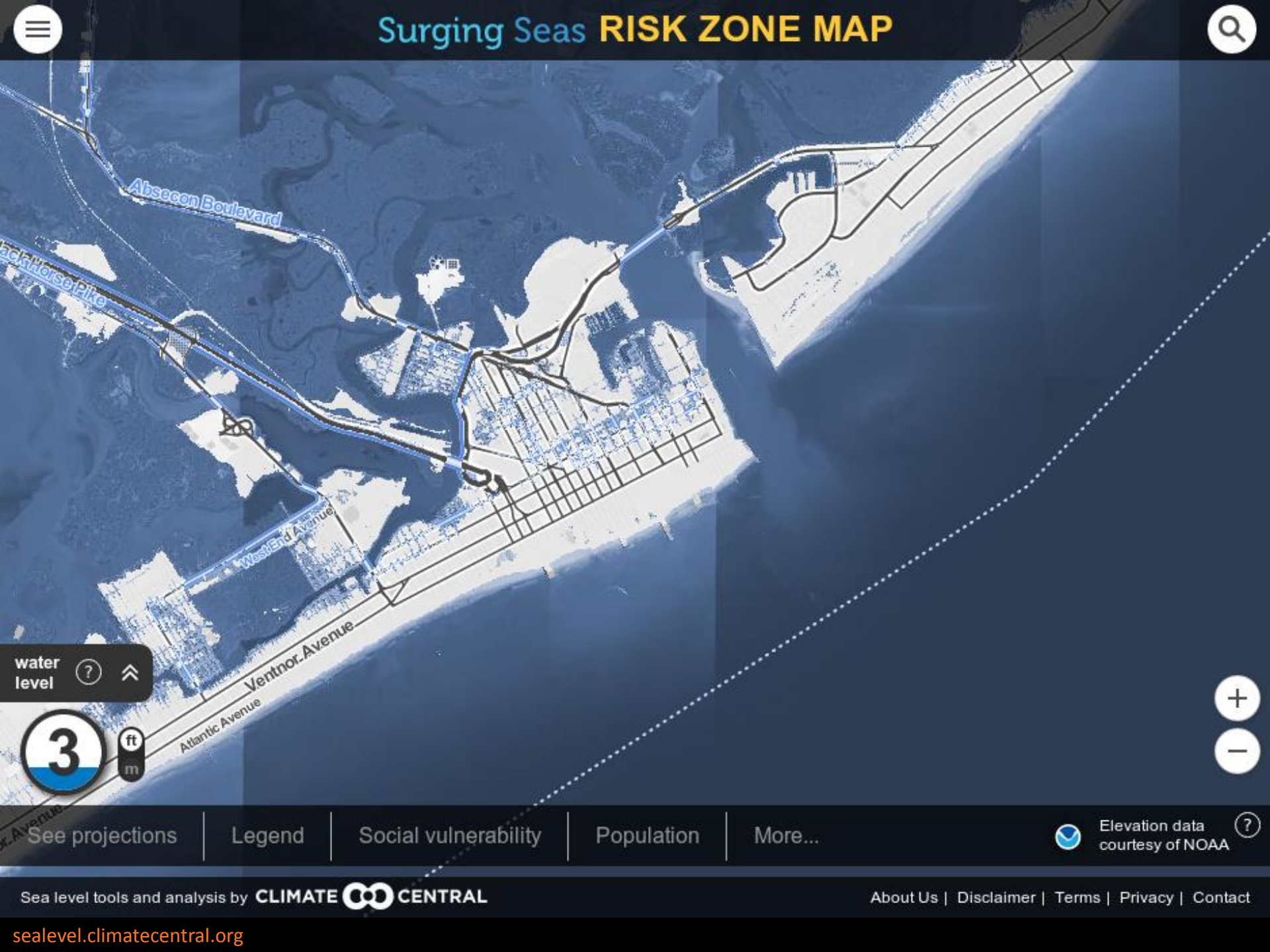
Surging Seas RISK ZONE MAP
Absecon Boulevard
Jackson Horse Pike
West End Avenue
Ventnor Avenue
Atlantic Avenue
water level
3
ft
m
See projections
Legend
Social vulnerability
Population
More...
Elevation data courtesy of NOAA
Sea level tools and analysis by CLIMATE CENTRAL
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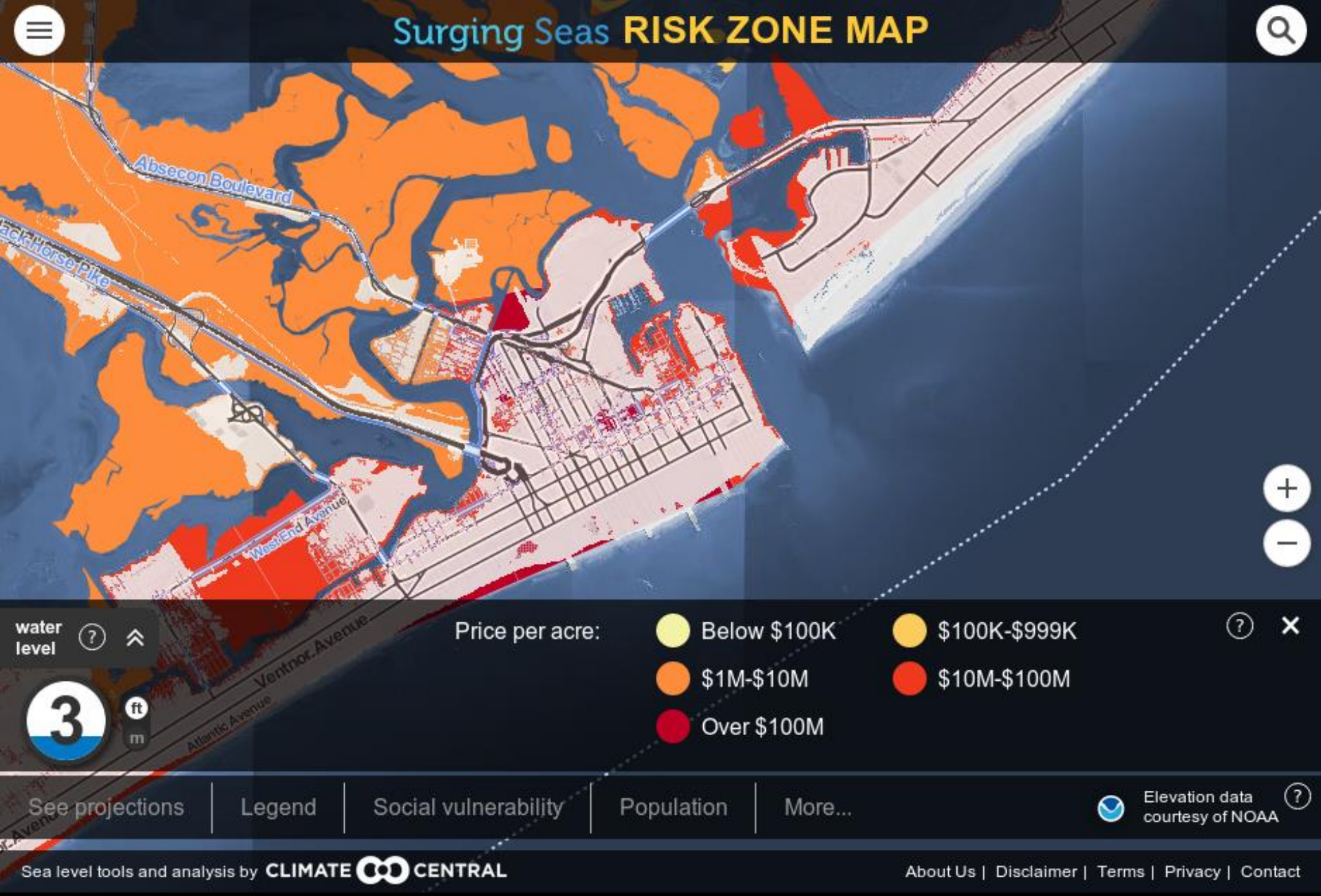

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CLIMATE CENTRAL

NEW JERSEY AND THE SURGING SEA

A VULNERABILITY ASSESSMENT WITH PROJECTIONS FOR SEA LEVEL RISE AND COASTAL FLOOD RISK

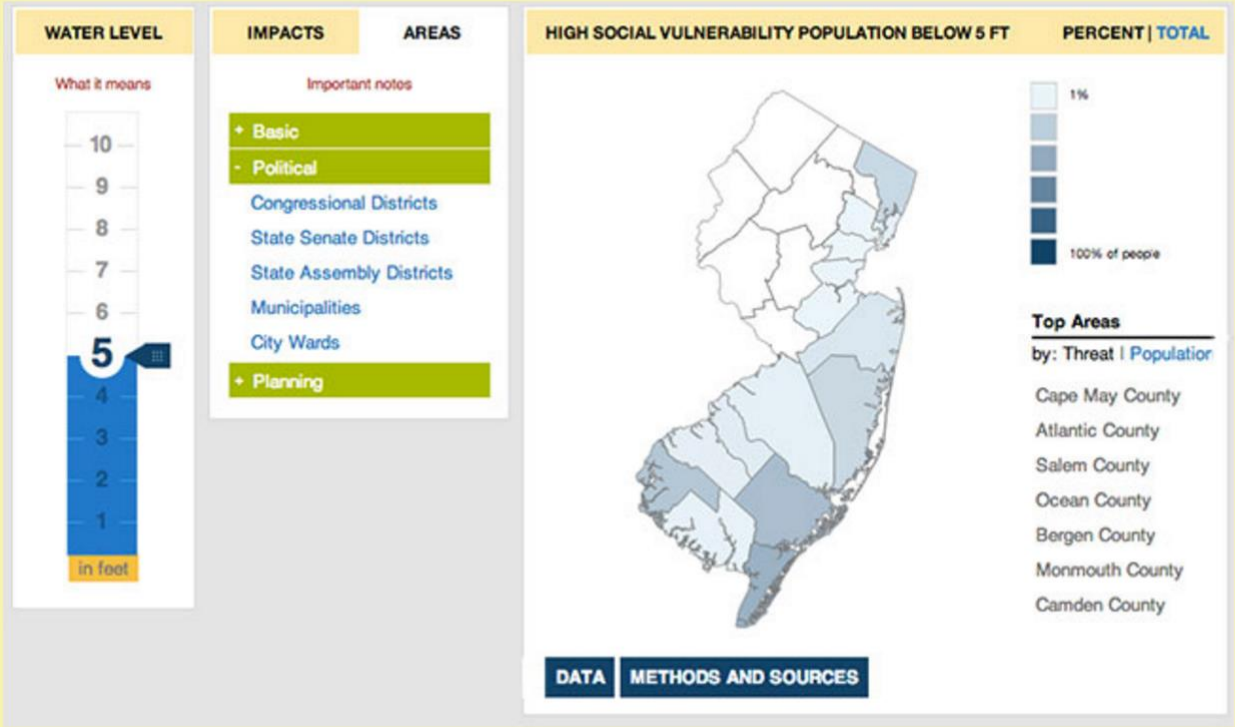
Risk Finder: New Jersey

See More States | U.S. (v1)

CHOOSE A TOOL: **Map** | **Forecast** | **Analysis** | **Comparison** | **Fast Look Reports**

Heat maps of sea level rise & flood exposure, by topic

CLICK TO COMPARE: Population, Property, Roads, EPA sites, Schools, Hospitals, Railroads, Power Plants, High Social Vulnerability Population, plus many more feature types, via the tool.



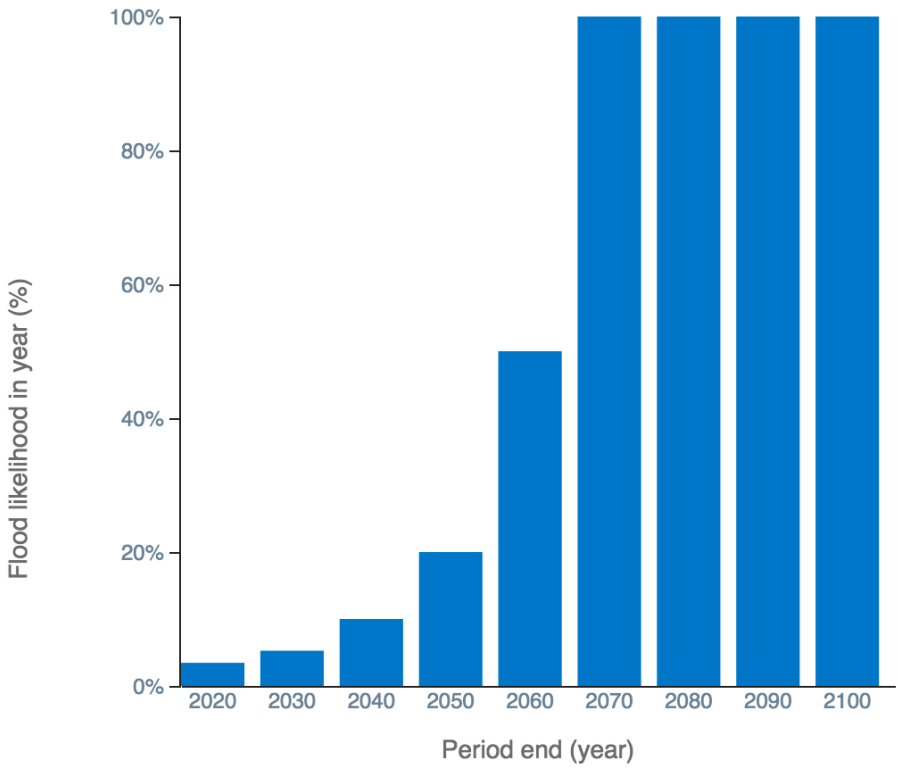
Quick Start Video

TECHNICAL REPORT
New Jersey and the Surging Sea

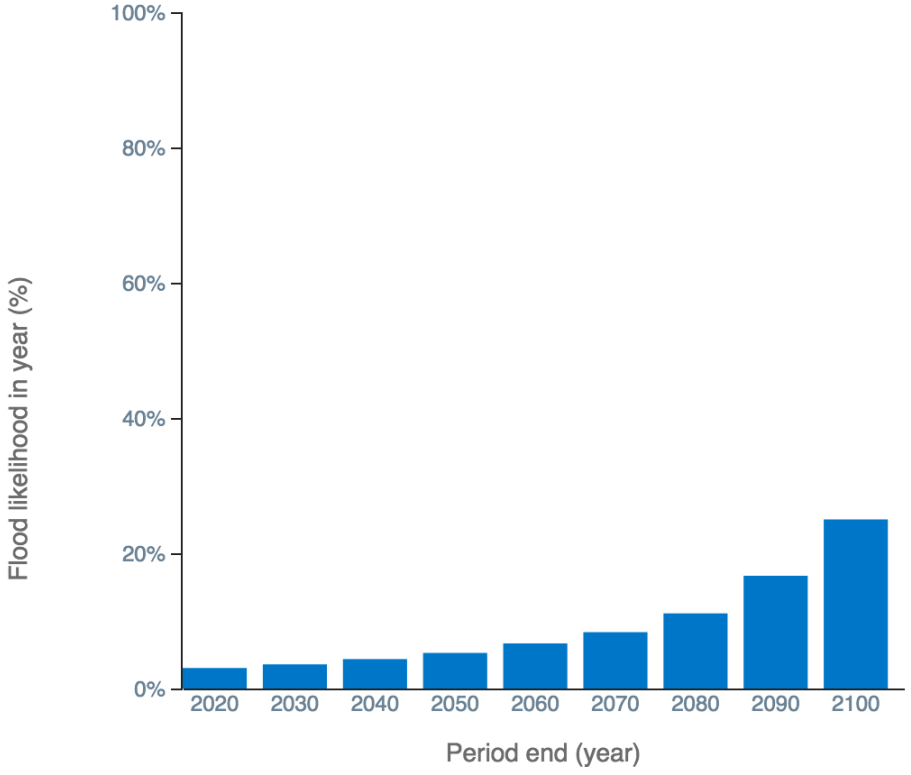
- Tools Comparison Matrix
- Science Behind the Tool
- NJ Resiliency Resources
- FAQs
- Quick Tutorials / Help
- About
- Feedback
- Custom Analysis

Annual risk of 5 ft flood: The Battery

High emissions / SLR

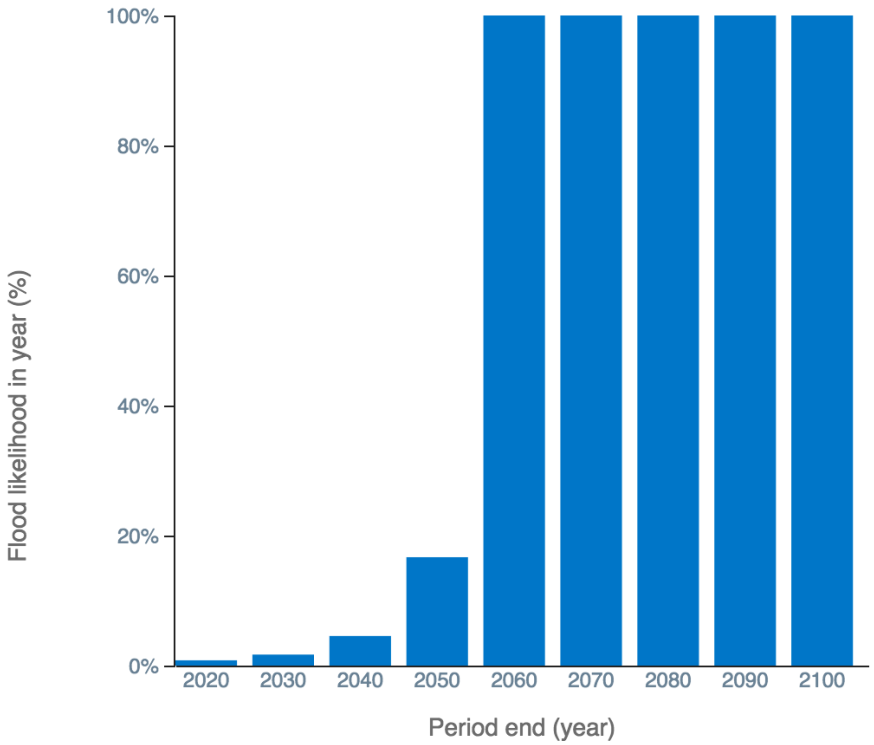


Low emissions / SLR

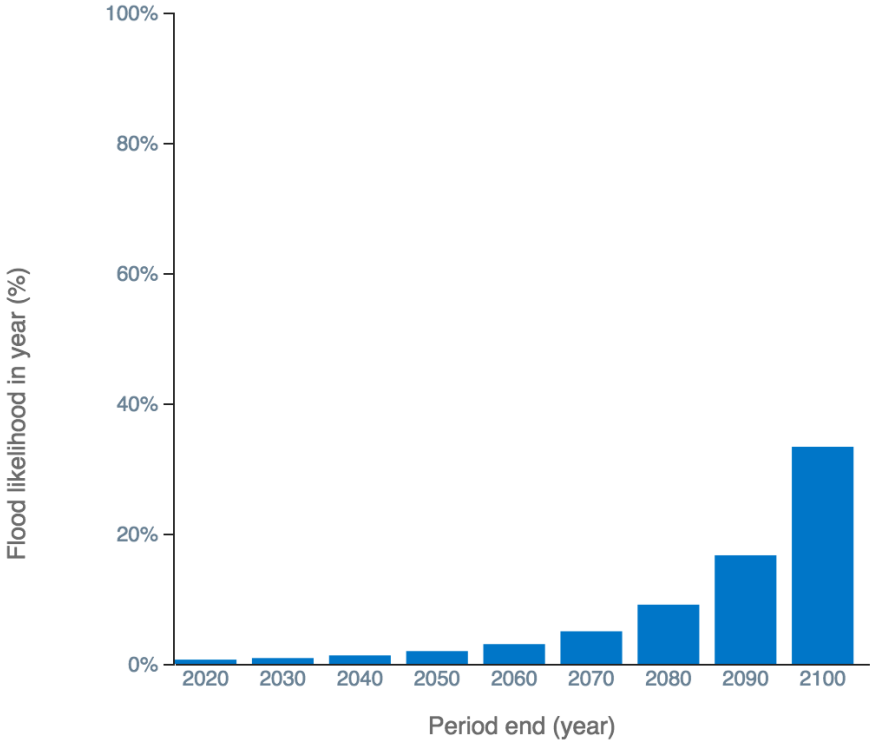


Annual risk of 5 ft flood: Atlantic City

High emissions / SLR

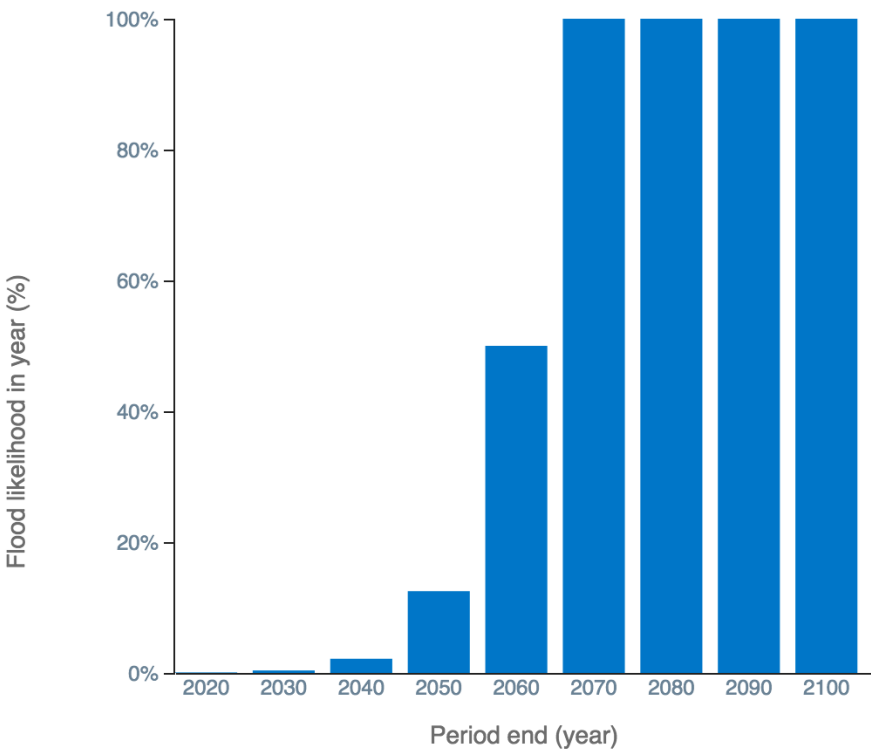


Low emissions / SLR

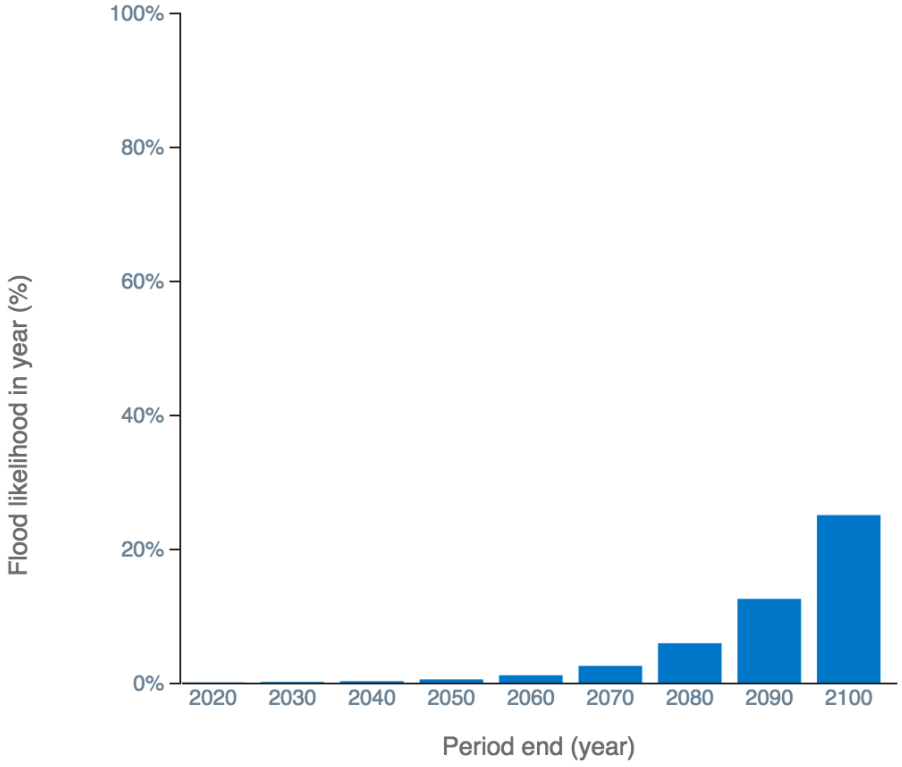


Annual risk of 5 ft flood: Cape May

High emissions / SLR



Low emissions / SLR



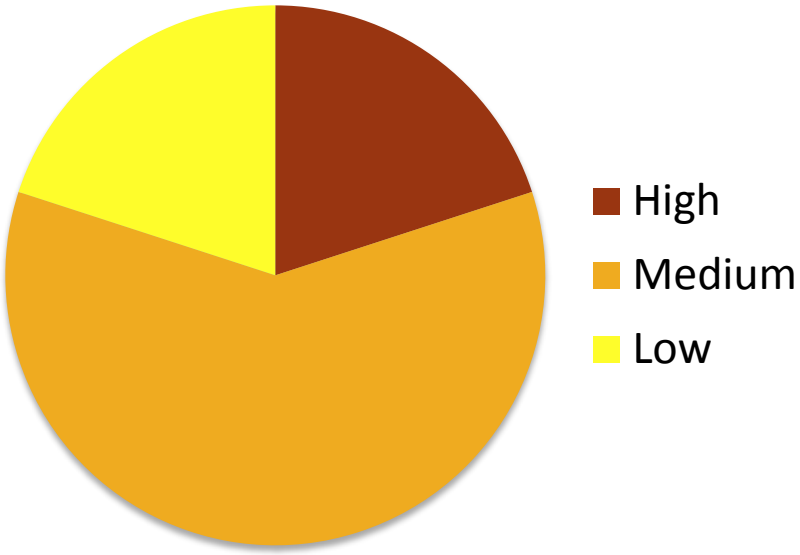
New Jersey below 5 feet

Item	Total
Land	182,000 acres
Population	295,000
Housing units	211,000
Property value	$112 billion
Road miles	2,144
EPA-listed sites	1,714

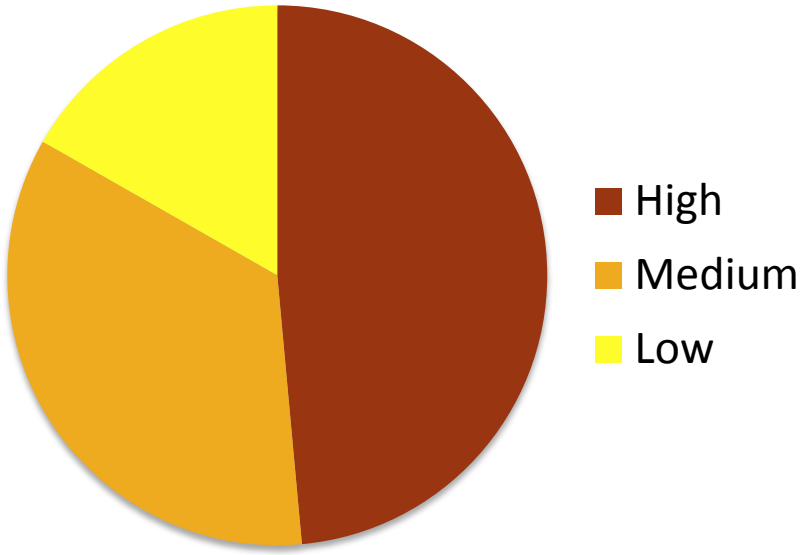
Plus 76 schools, 44 houses of worship, 17 rail stations, 15 intermodal freight terminals, 18 superfund sites, much more

Social vulnerability of population in NJ

New Jersey overall

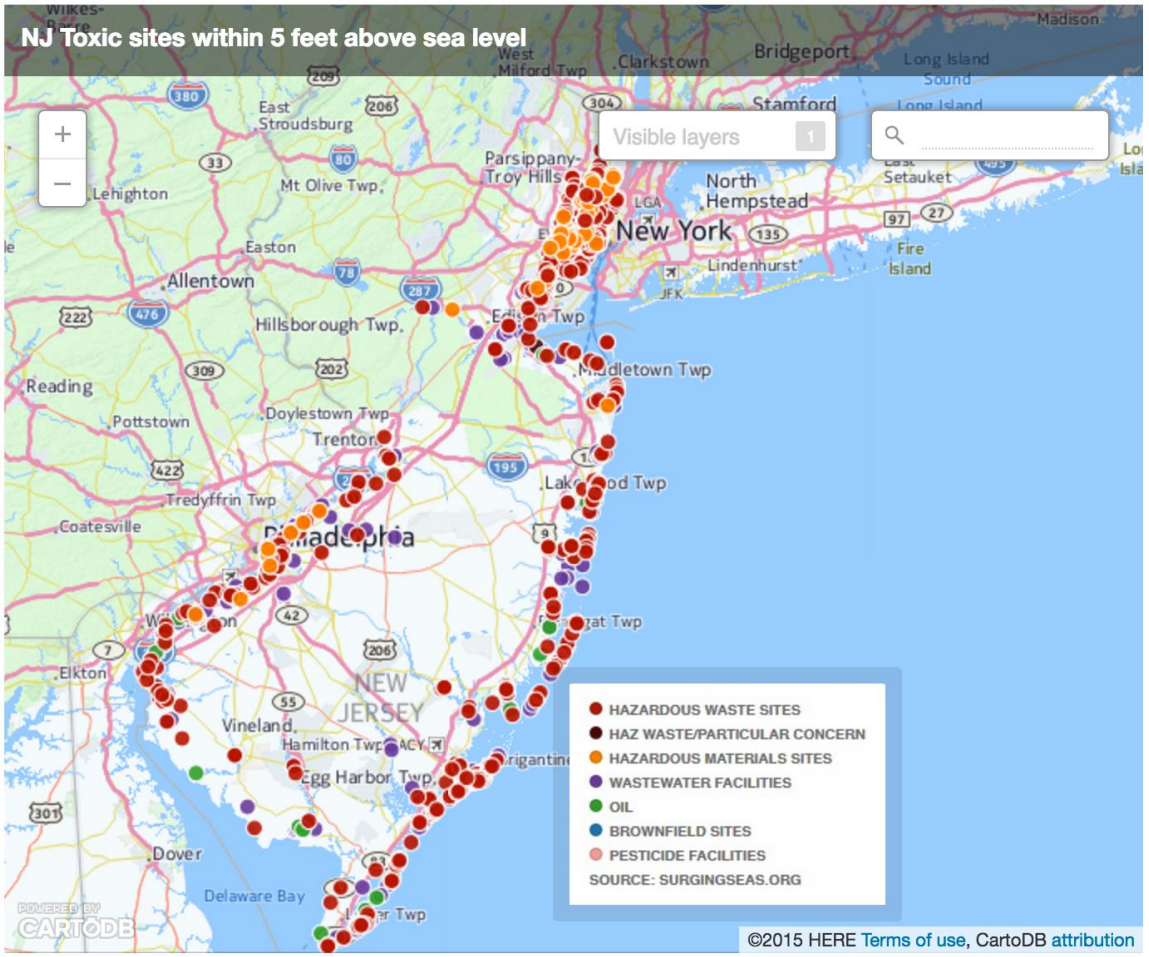


On land below 5 ft



NJ SPOTLIGHT
NEWS, ISSUES AND INSIGHT FOR NEW JERSEY

DIRTY LITTLE SECRETS



of spreading contamination. Using data from Surging Seas, a project of Climate Central, we've mapped nearly 1,700 New Jersey sites listed in the EPA's Facility Registry Service that are within five feet of sea level and thus potentially vulnerable over the coming decades.

CLIMATE CENTRAL

Carbon choices determine US cities committed to futures below sea level

Benjamin H. Strauss[a,1], Scott Kulp[a], and Anders Levermann[b,c]

[a]Climate Central, Princeton, NJ 08542; [b]Potsdam Institute for Climate Impact Research, 14473 Potsdam, Germany; and [c]Physics Institute of Potsdam University, 14476 Potsdam, Germany

Edited by James Hansen, Columbia University, New York, NY, and approved September 18, 2015 (received for review June 8, 2015)

Anthropogenic carbon emissions lock in long-term sea-level rise that greatly exceeds projections for this century, posing profound challenges for coastal development and cultural legacies. Analysis based on previously published relationships linking emissions to warming and warming to rise indicates that unabated carbon emissions up to the year 2100 would commit an eventual global sea-level rise of 4.3–9.9 m. Based on detailed topographic and population data, local high tide lines, and regional long-term sea-level commitment for different carbon emissions and ice sheet stability scenarios, we compute the current population living on endangered land at municipal, state, and national levels within the United States. For unabated climate change, we find that land that is home to more than 20 million people is implicated and is widely distributed among different states and coasts. The total area includes 1,185–1,825 municipalities where land that is home to more than half of the current population would be affected, among them at least 21 cities exceeding 100,000 residents. Under aggressive carbon cuts, more than half of these municipalities would avoid this commitment if the West Antarctic Ice Sheet remains stable. Simi-

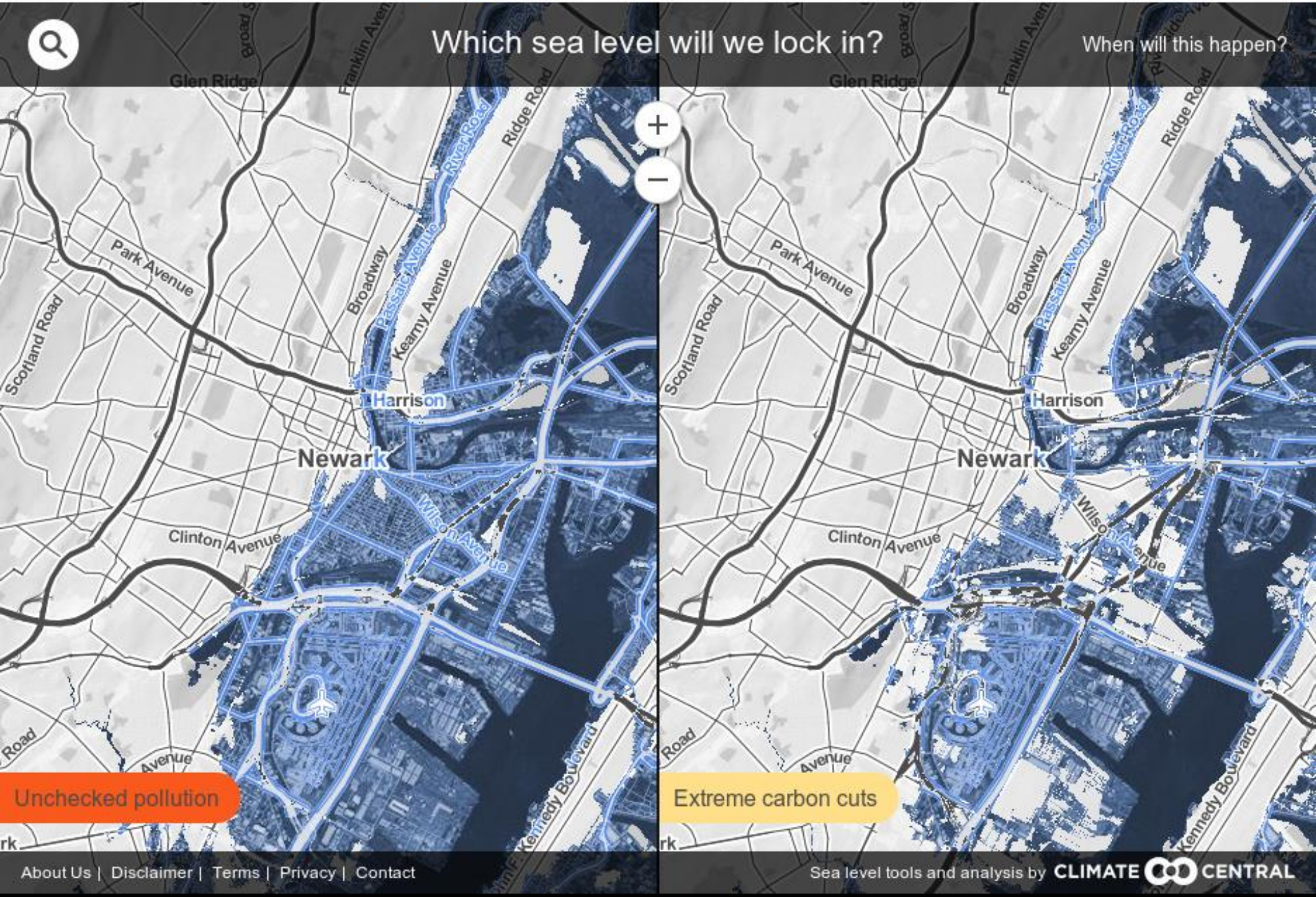
of up to 1.2 m this century has been estimated to threaten up to 4.6% of the global population and 9.3% of annual global gross domestic product with annual flooding by 2100 in the absence of adaptive measures (12). Higher long-term sea levels endanger a fifth of all United Nations Educational, Scientific and Cultural Organization world heritage sites (13). These global analyses depend on elevation data with multimeter rms vertical errors that consistently overestimate elevation and thus underestimate submergence risk (14). Here we explore the challenges posed under different scenarios by long-term SLR in the United States, where highly accurate elevation and population data permit robust exposure assessments (15, 16).

Our analysis combines published relationships between cumulative carbon emissions and warming, together with two possible versions of the relationship between warming and sea level, to estimate global and regional sea-level commitments from different emissions totals. The first version, the "baseline" case, employs a minor modification of the warming–SLR relationship from Levermann et al. (10) The second version, the "triggered"

Surging Seas MAPPING CHOICES

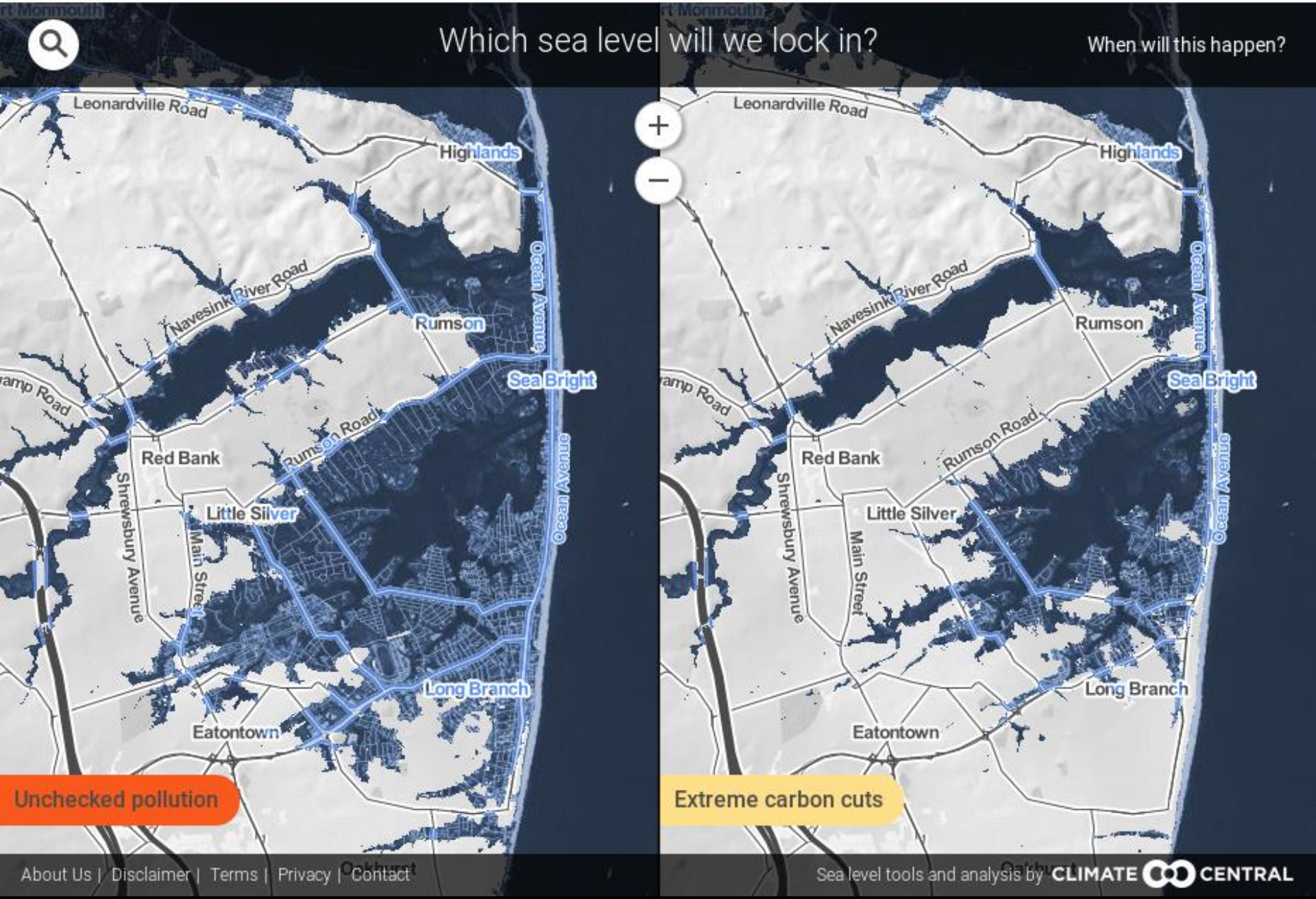
Sea level tools and analysis by CLIMATE CENTRAL

Surging Seas MAPPING CHOICES



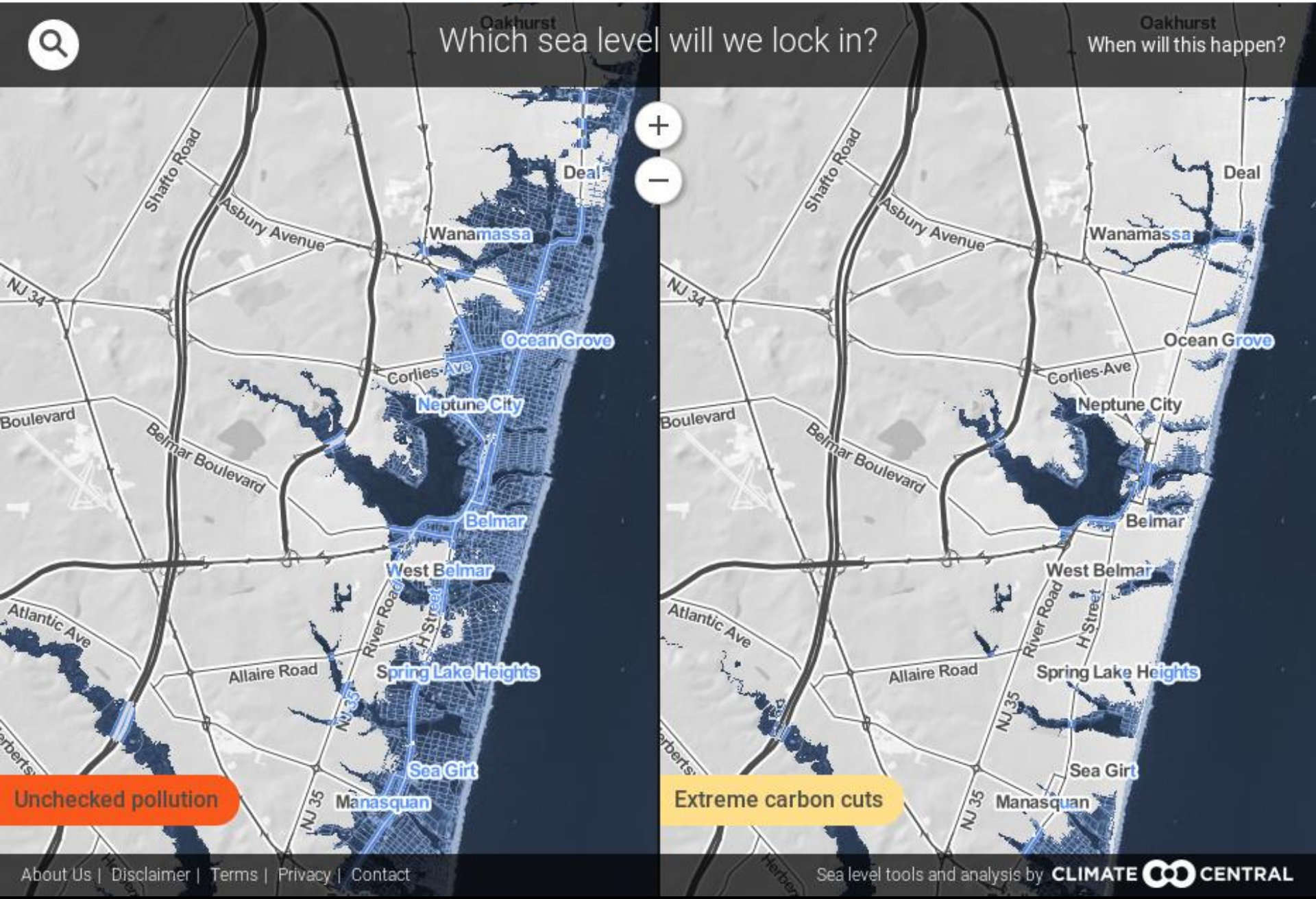
Sea level tools and analysis by CLIMATE CENTRAL

Surging Seas MAPPING CHOICES

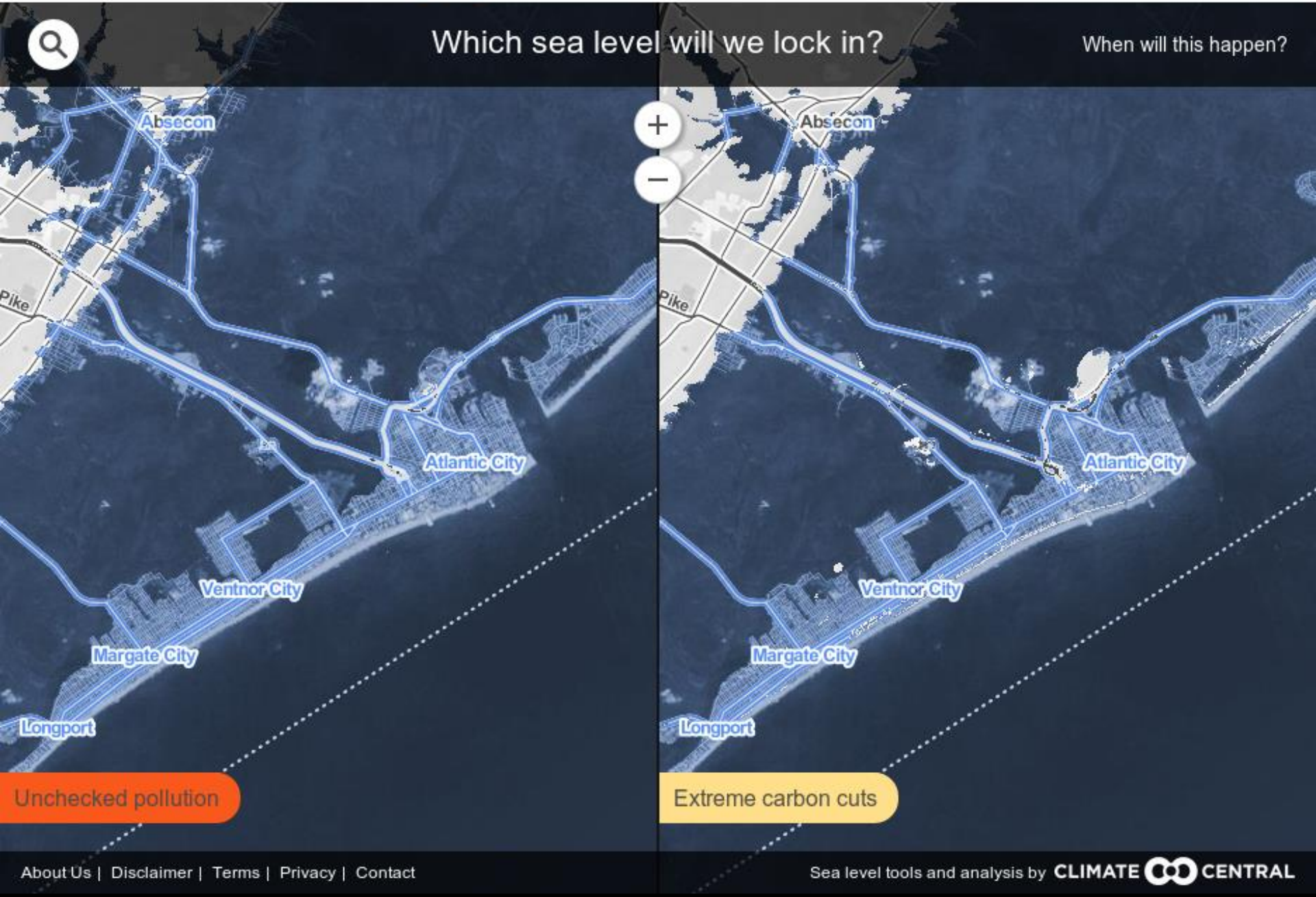


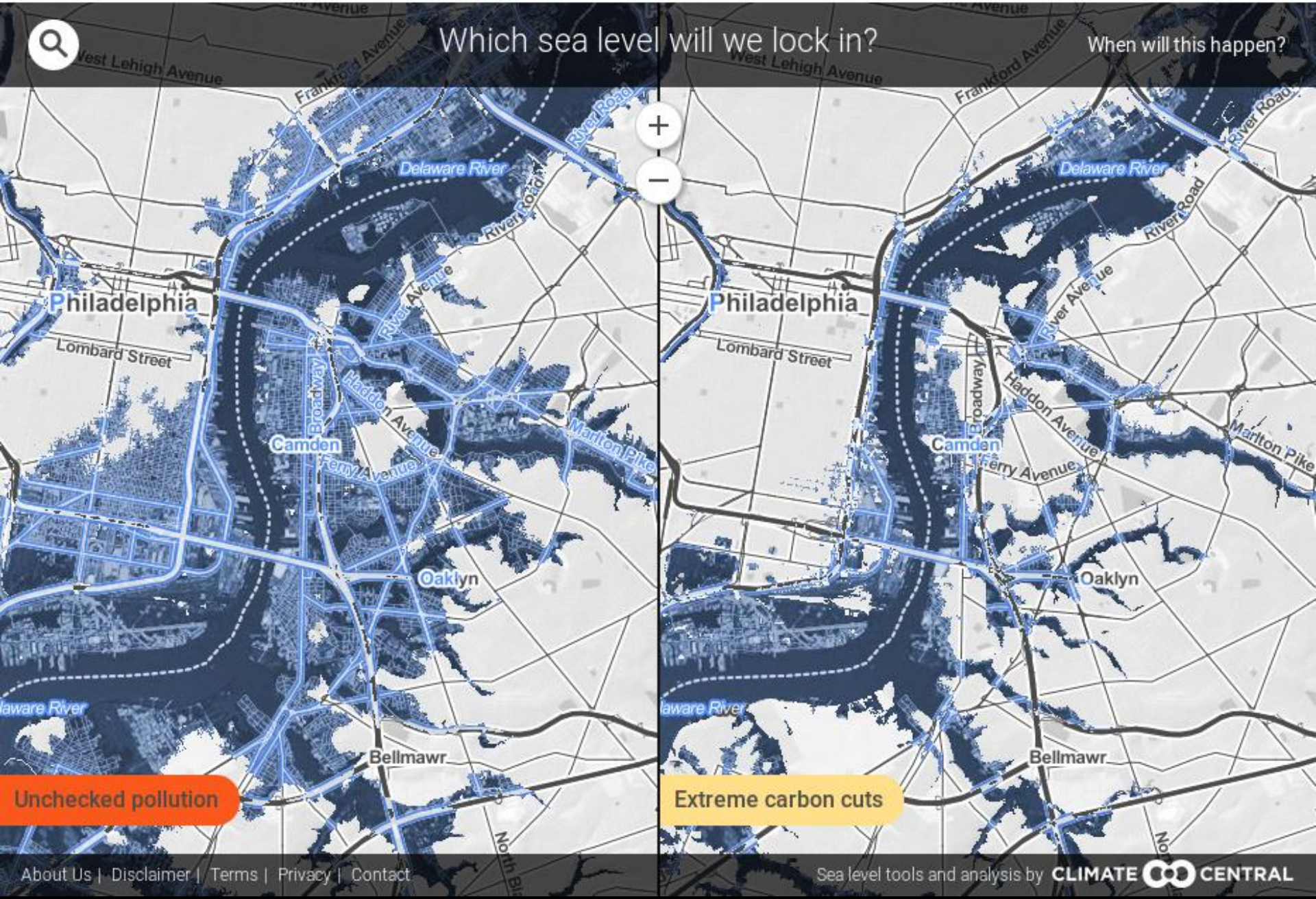
Sea level tools and analysis by CLIMATE CENTRAL

Surging Seas MAPPING CHOICES



Sea level tools and analysis by CLIMATE CENTRAL


Which sea level will we lock in?
When will this happen?
Absecon
Pike
Atlantic City
Ventnor City
Margate City
Longport
Absecon
Pike
Atlantic City
Ventnor City
Margate City
Longport
Unchecked pollution
Extreme carbon cuts


Which sea level will we lock in?
When will this happen?
Philadelphia
Lombard Street
Camden
Oaklyn
Bellmawr
Delaware River
River Road
Broadway
Haddon Avenue
Ferry Avenue
Marlton Pike
Unchecked pollution
Extreme carbon cuts

sealevel.climatecentral.org

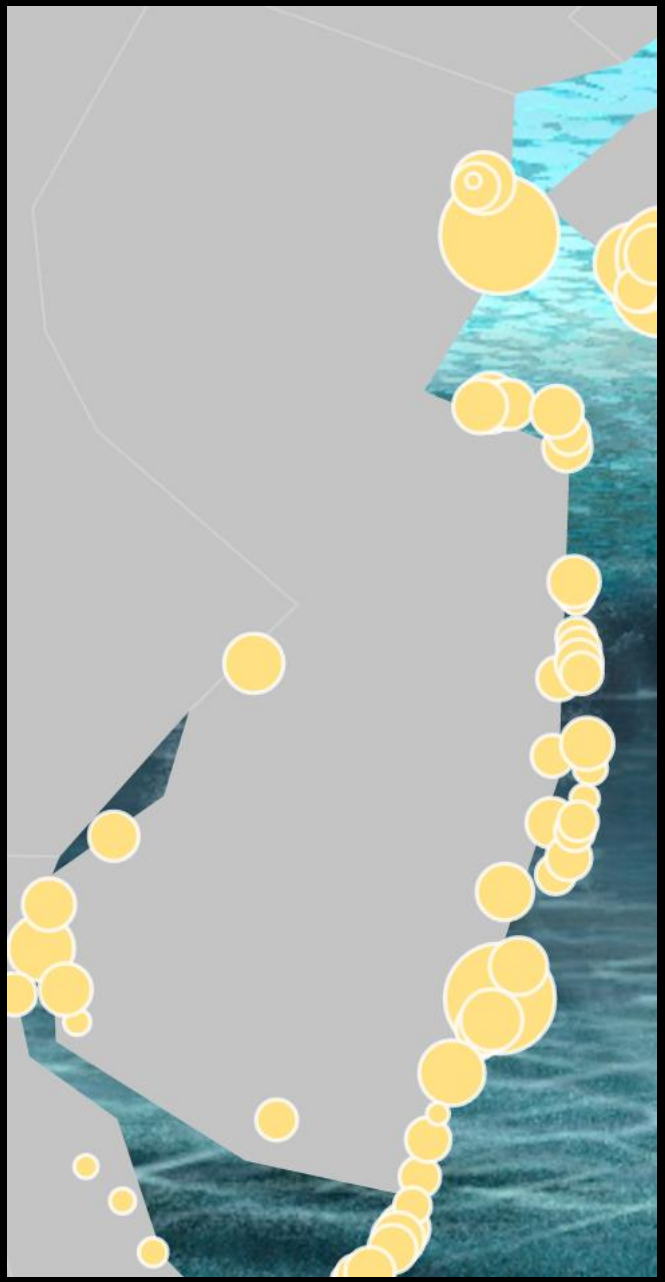


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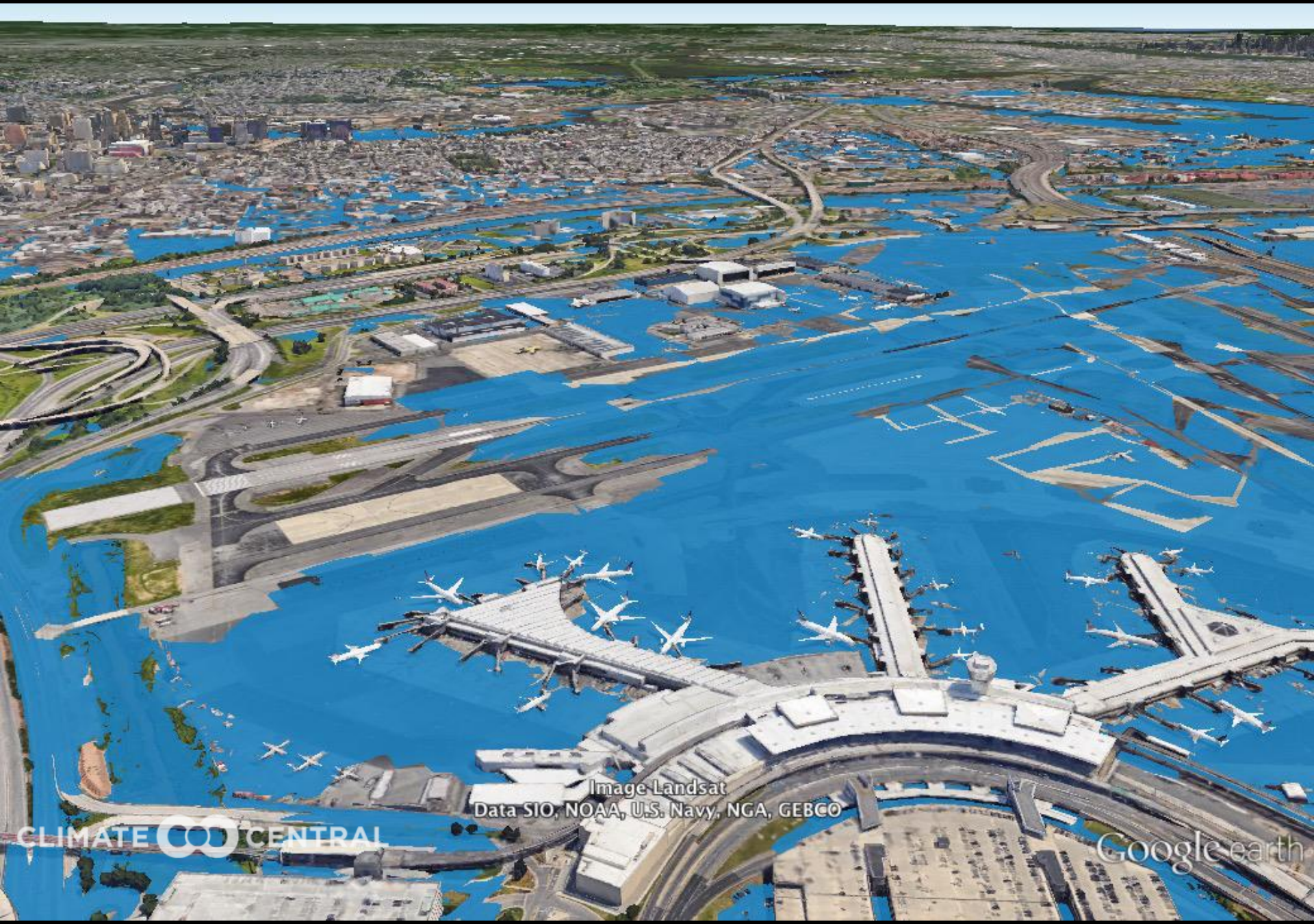
Image Landsat
CLIMATE CENTRAL
Google earth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Data SIO, NOAA, U.S. Navy, NGA, GEBCO
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Google earth

ARTICLE

doi:10.1038/nature17145

Contribution of Antarctica to past and future sea-level rise

Robert M. DeConto[1] & David Pollard[2]

Polar temperatures over the last several million years have, at times, been slightly warmer than today, yet global mean sea level has been 6–9 metres higher as recently as the Last Interglacial (130,000 to 115,000 years ago) and possibly higher during the Pliocene epoch (about three million years ago). In both cases the Antarctic ice sheet has been implicated as the primary contributor, hinting at its future vulnerability. Here we use a model coupling ice sheet and climate dynamics—including previously underappreciated processes linking atmospheric warming with hydrofracturing of buttressing ice shelves and structural collapse of marine-terminating ice cliffs—that is calibrated against Pliocene and Last Interglacial sea-level estimates and applied to future greenhouse gas emission scenarios. Antarctica has the potential to contribute more than a metre of sea-level rise by 2100 and more than 13 metres by 2500, if emissions continue unabated. In this case atmospheric warming will soon become the dominant driver of ice loss, but prolonged ocean warming will delay its recovery for thousands of years.

Reconstructions of the global mean sea level (GMSL) during past warm climate intervals including the Pliocene (about three million years ago)[1] and late Pleistocene interglacials[2–5] imply that the Antarctic ice sheet has considerable sensitivity. Pliocene atmospheric CO_2 concentrations were comparable to today's (~400 parts per million by volume, p.p.m.v.)[6], but some sea-level reconstructions are 10–30 m higher[1,7]. In addition to the loss of the Greenland Ice Sheet and the West Antarctic subglacial basins with reverse-sloping, marine-terminating outlet troughs up to 1,500 m deep (Fig. 1). The ice above floatation in these East Antarctic basins is much thicker than in West Antarctica, with the potential to raise GMSL by around 20 m if the ice in those basins is lost[13]. Importantly, previous ice-sheet simulations accounting for migrating grounding lines and MISI dynamics have shown the potential for repeated WAIS retreats and readvances over the past few million

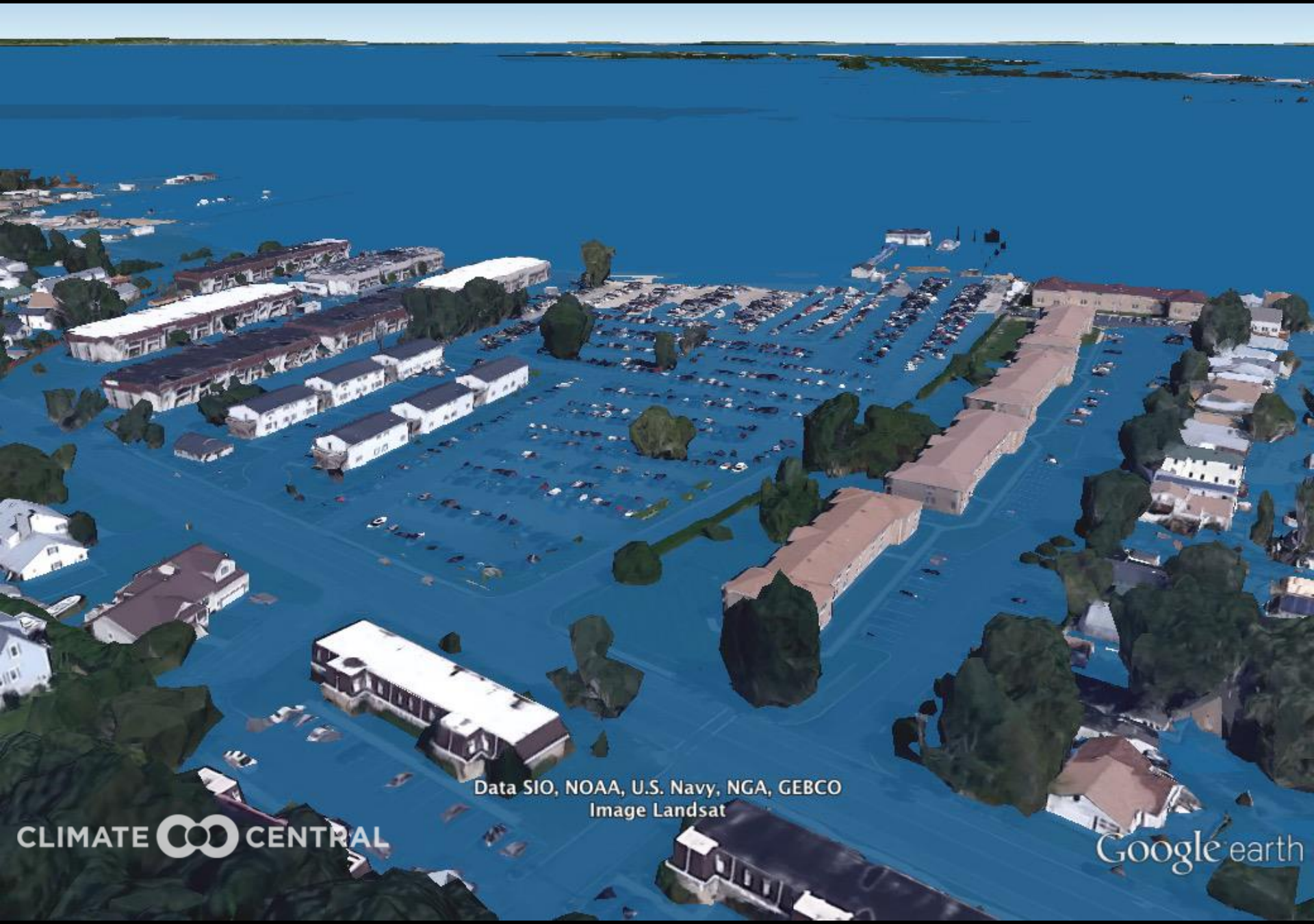
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Image Landsat
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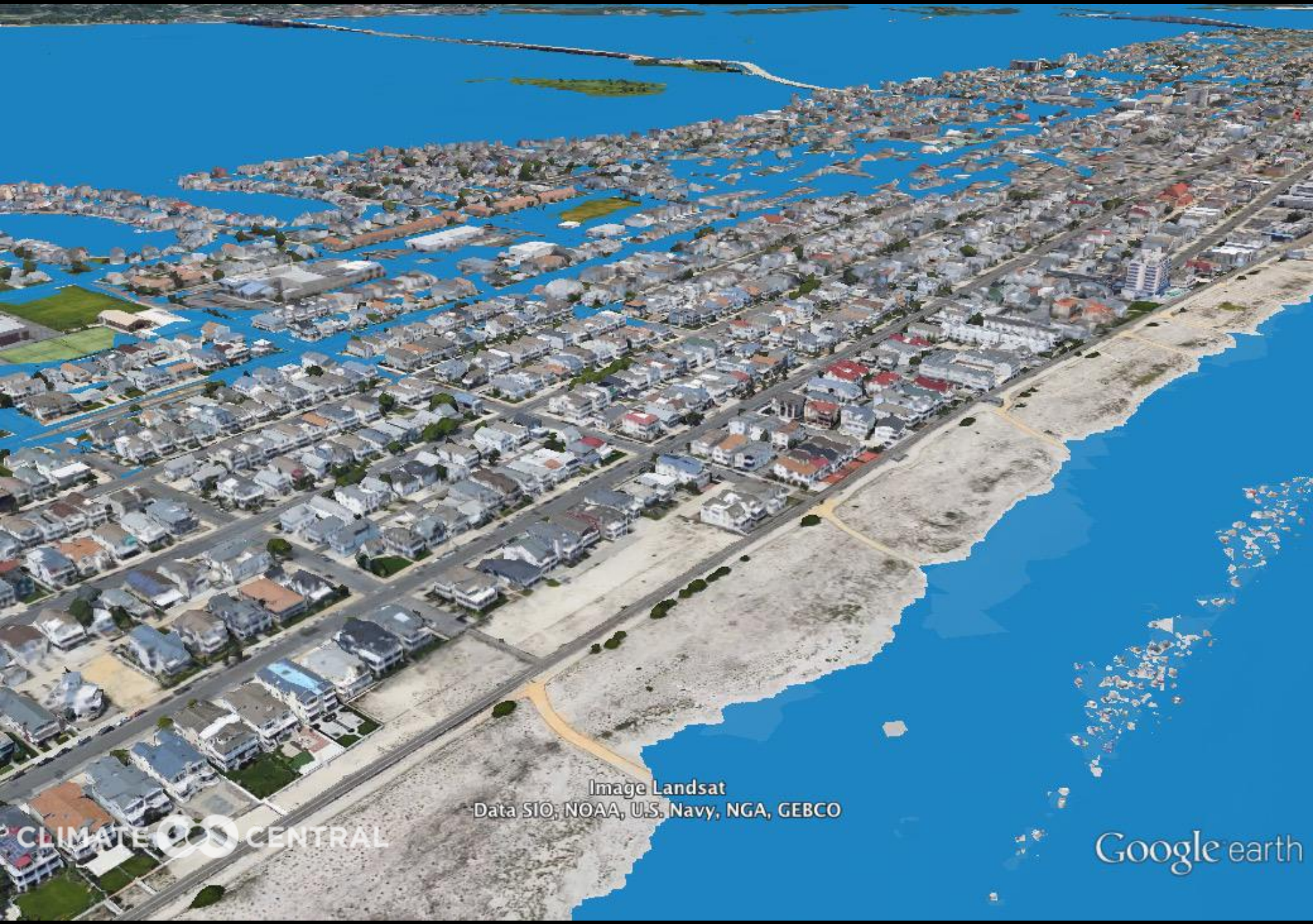
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Bigroger27509

Thank you

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Sustainable State of the State Report Update

Dr. Melanie McDermott
Senior Researcher,
Sustainable Jersey &
Sustainability Institute @ TCNJ

2016 NEW JERSEY SUSTAINABILITY SUMMIT

Sustainable State of the State Report

- Defines *sustainability* for New Jersey along….
  - **14 dimensions** (water, energy, health…), in terms of …
  - **57 goals** that describe the *outcomes* we wish to see;
- Measures progress toward (or away from) goals by…
  - **117 indicators**.

How Is New Jersey Doing?

Drinking water from wells and public water systems is clean and safe for human consumption.

Public Water Supply Violations

The percent of community water systems meeting current standards for microbial and chemical contamination is high and has not changed significantly.

Tap Water Quality

There are no readily available statewide data on the quality of water as it comes from the tap despite concerns about lead and other major contaminants that can be introduced as water moves through pipes to faucets in homes, schools, and other institutions.

Water quality in streams, lakes, and wetlands is sufficient to support native species and ecosystem functions, and safe for human recreation and fish consumption.

Surface Water Quality

The portion of NJ's water bodies that meet quality standards for various uses is declining. Standards exist for fishing, swimming, shellfish harvesting, drinking water supply, and aquatic life. Fewer than 20% of water bodies in New Jersey are rated as "fully supporting" recreational uses.

River and Stream Biodiversity

Surveys of streambed life (benthic macroinvertebrates) show that the number of stretches of New Jersey rivers with health rated "excellent" is in decline. The number rated "poor" is also in decline.

Water supply, including stream flow and groundwater recharge, is sufficient both for human uses (household, agricultural, and recreational) and for ecosystems, providing for healthy aquatic and riparian habitat and biodiversity.

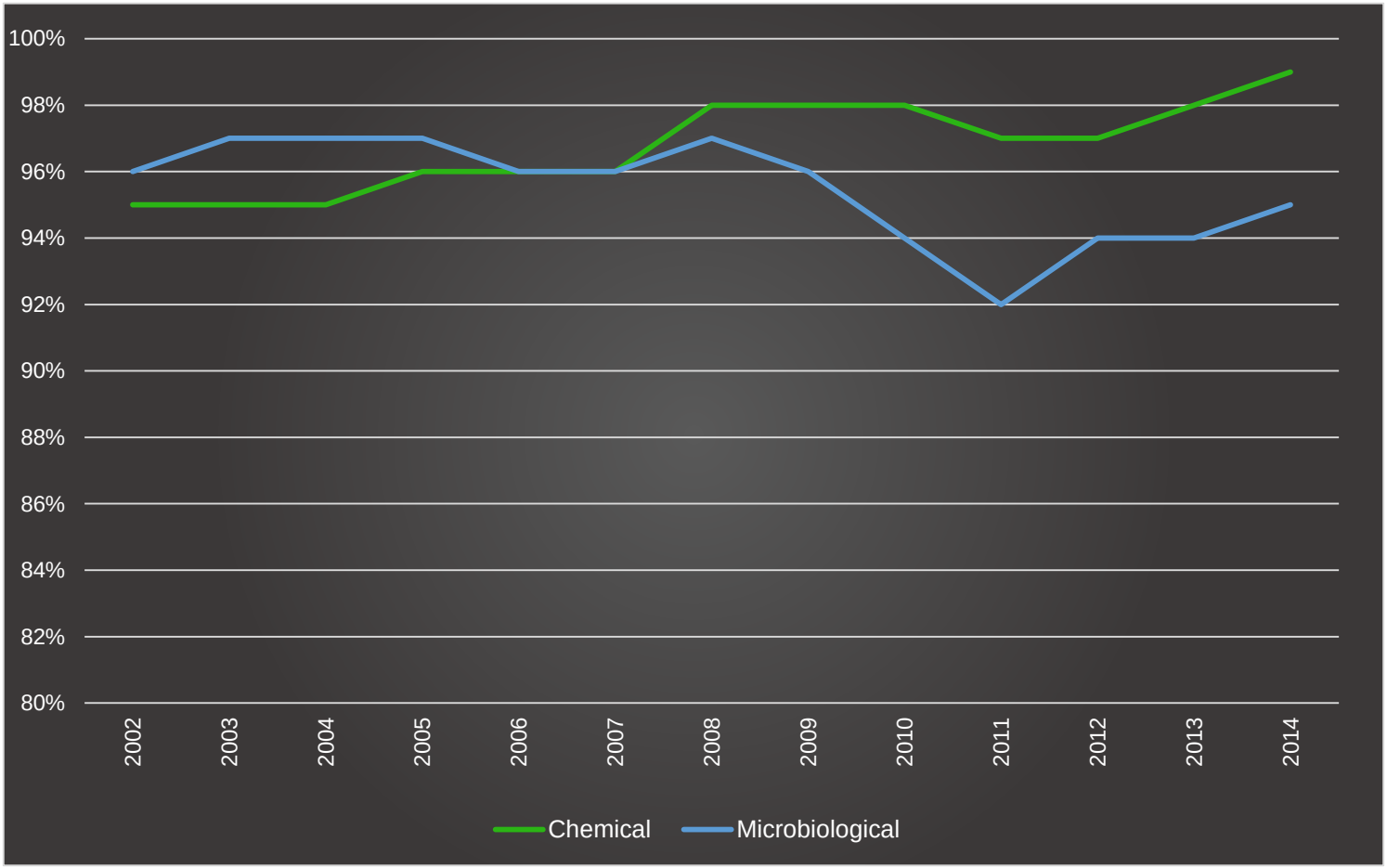
Surface Water Flow

Four of ten NJ watersheds had impaired surface water flow from 2000-2009. This figure would be higher if we accounted for sensitive species and critical water supply regions, this figure would be higher.

Ground Water Level

There are currently no statewide data readily available that show the condition of all our groundwater and aquifers, although there are regional indications of concern.

% Community Water Systems in Compliance w/Drinking Water Quality Requirements



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Where do we stand in 2016?

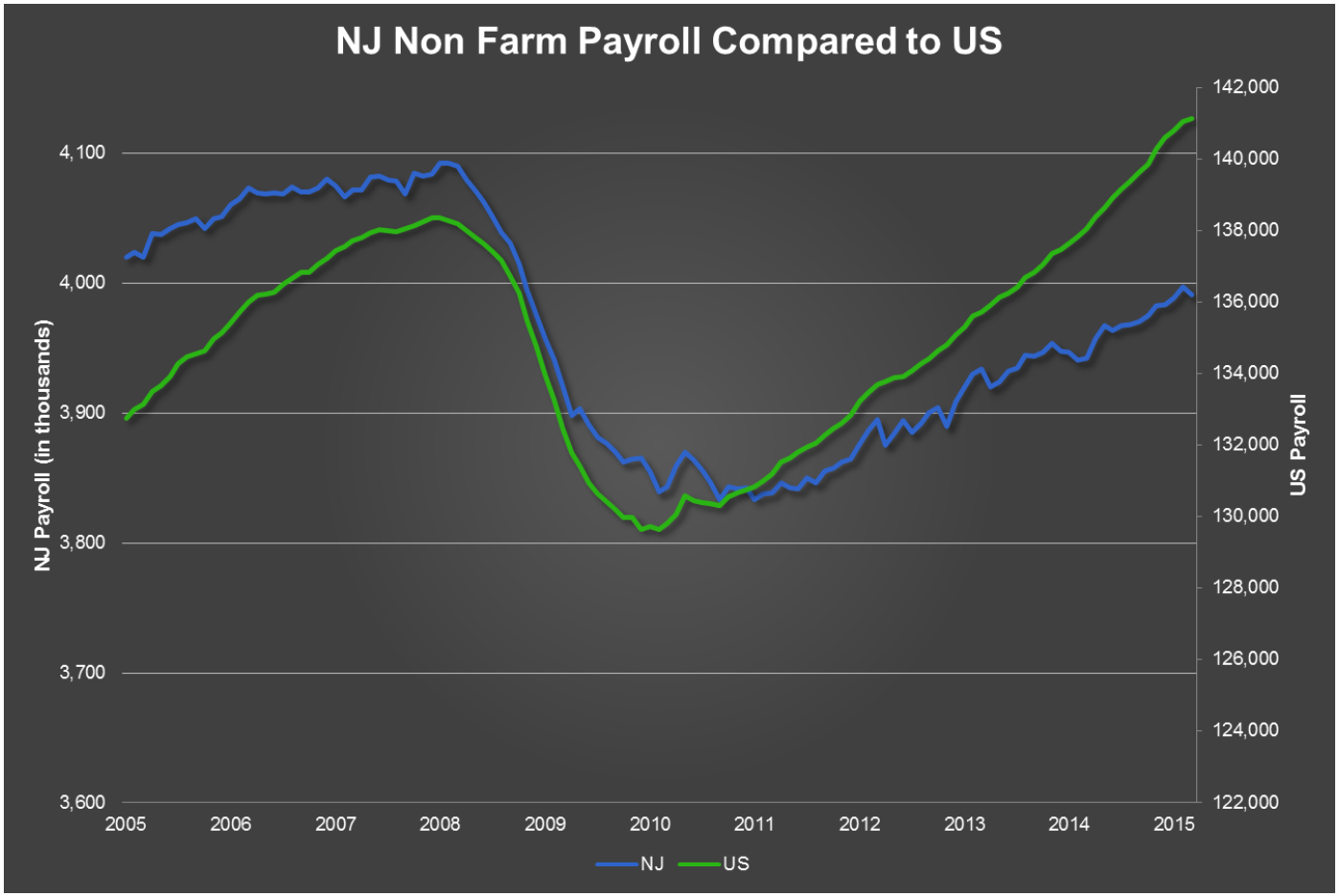
- Inadequate progress on **27** out of **57 goals**:
  - Most of these trends ongoing -- also negative or uncertain in 2015
- Judgment on **2** goals flipped in negative direction, both in *Transportation* dimension

Transportation

Goal	Indicator	
Transportation enables efficient movement of people & goods		
	Vehicle Miles Traveled per $ GSP	
Environmental impacts of construction & use of transportation infrastructure minimized		
	GHG Emissions	

Economy

- Business sector is robust



Economy – *Equity?*

Goal	Indicators	
Household income is adequate to meet needs		
	Median Income	
	% Population Below 250% of Federal Poverty Line	
Wealth & income inequality doesn't undermine economic opportunity		
	Income Inequality	
Economy supplies quality jobs sufficient to support families		
	Un-/Under-employment	
	Hours of work/week to meet real cost of living	

Other unsustainable trends:

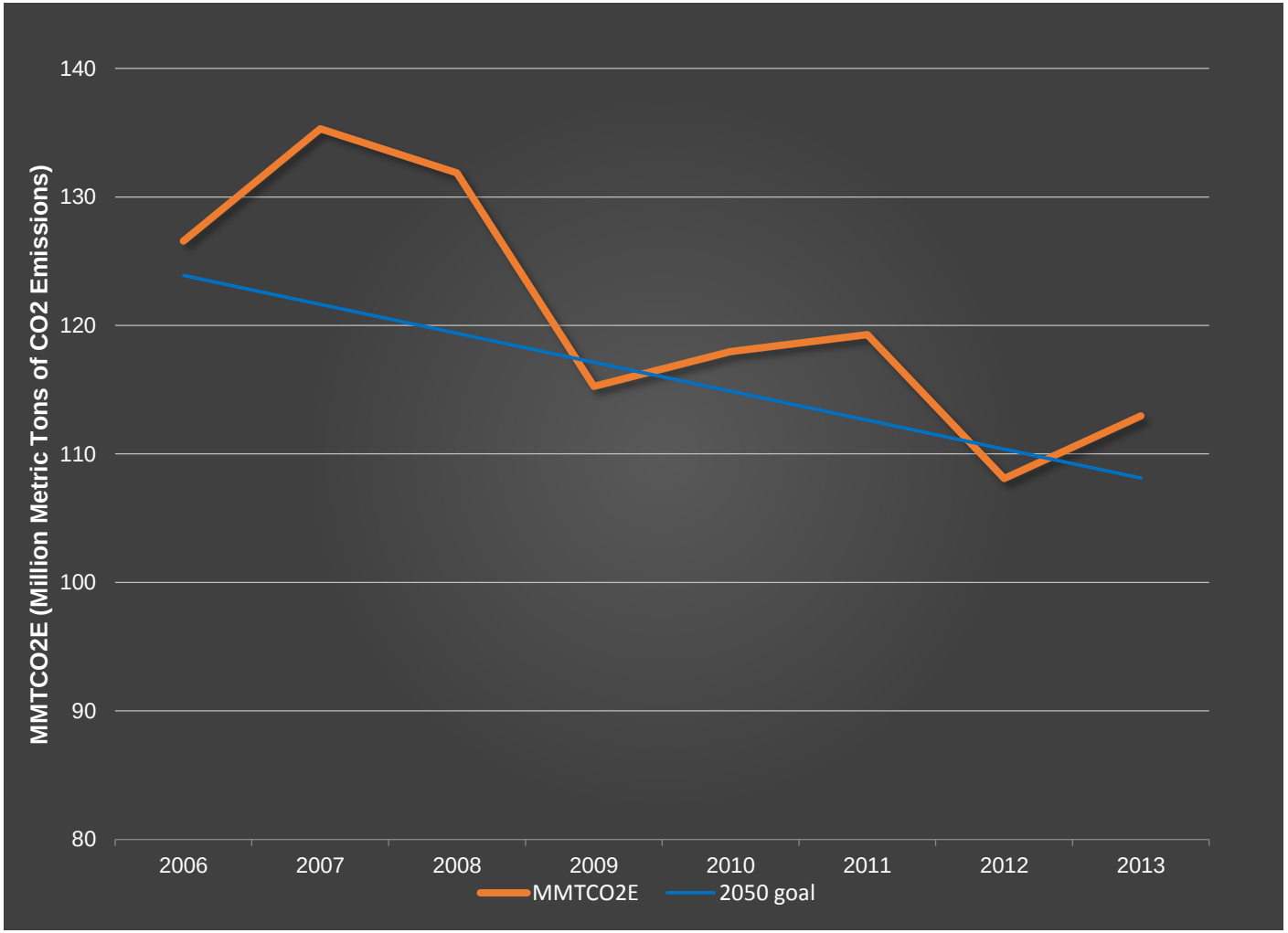
- Losing biodiversity
- Losing open space
- Backlog of infrastructure upgrades:
  - Water system
  - Transportation system
- Generating more waste
- Recycling lower % of waste
- Increase suicide rate

Positive Trends:

- Decreased racial and ethnic disparities in:
  - Education
    - test scores (NAEP)
    - high school graduation
  - Health
    - premature death
    - diabetes
- More people have health insurance.
- Fewer asthma hospitalizations.
- Air quality is improving.
- Violent crime continues to drop.
- Renewable energy production is up.

Energy-Related CO_2 Emissions: Actual & Target

- GHG reduced in time to avert cata-strophic climate change



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Mapping Out Gold

Randall Solomon
Co-Director,
Sustainable Jersey &
Sustainability Institute @
TCNJ

From Last Year: Our Objectives

- Define an inspirational vision and goals for a sustainable New Jersey
- Track progress
- Guide our work
  - Assess Sustainable Jersey actions
  - Lay foundation for Gold level of certification
  - Determine community-level contribution necessary to achieve sustainable state collectively

Getting to Gold

- Bronze:
  - Made a commitment to Sustainability
  - Created internal organization (green team)
  - Succeeded in implementing first significant actions
- Silver:
  - Beyond getting started
  - Making significant progress in a broad range of areas
  - Statewide leader

What is Gold?

- Highest level of certification
- Recognizes that a municipality is "on course" to becoming sustainable
- Measures performance, not just implementation of actions
- Builds a bridge between our actions and our vision
- Enables innovation/rewards performance/gets beyond current prescriptive actions

If every municipality were to perform at the Gold level…

…collectively municipalities would be "*doing their part*" to achieve our goals

The Strategy

- Start with Sustainable Jersey Goals
- Triangulate Gold Standard Through Three Lenses:
  - What's needed? What does sustainability science say we *must* achieve?
  - What's possible? What can known strategies achieve right now?
  - What is *municipal role* in a federal system of shared government?
- Engage in Rigorous Stakeholder and Expert Process

The Process

- Certification Standards Committee
  - Gold Sub-committee of the Certification Standards Committee
- Energy Task Force
  - Gold Sub-Committee of the Energy Task Force
- Waste and Recycling Task Force
  - Gold Sub-Committee of the Energy Task Force
- Sustainable Jersey Staff
- Key Reviewers and Advisors
- Critical Support and Data from State Agencies

Releasing Gold Star Standards

- Gold will be rolled-out 1-3 new standards per year up to 14
- Gold Stars awarded one at a time for each Gold Standard met
- When a municipality achieves a majority of 14 Stars they are Gold Certified
- Municipalities must be Silver certified to be eligible for a Gold Star
- Releasing Energy and Waste Standards today
- Full standards on website (as a new action) by January 2017
- Applications for Gold Stars accepted June 2017

Sustainable Jersey Energy Goals

1.Decrease greenhouse gas emissions in time to avoid catastrophic climate impacts (environmental harm).

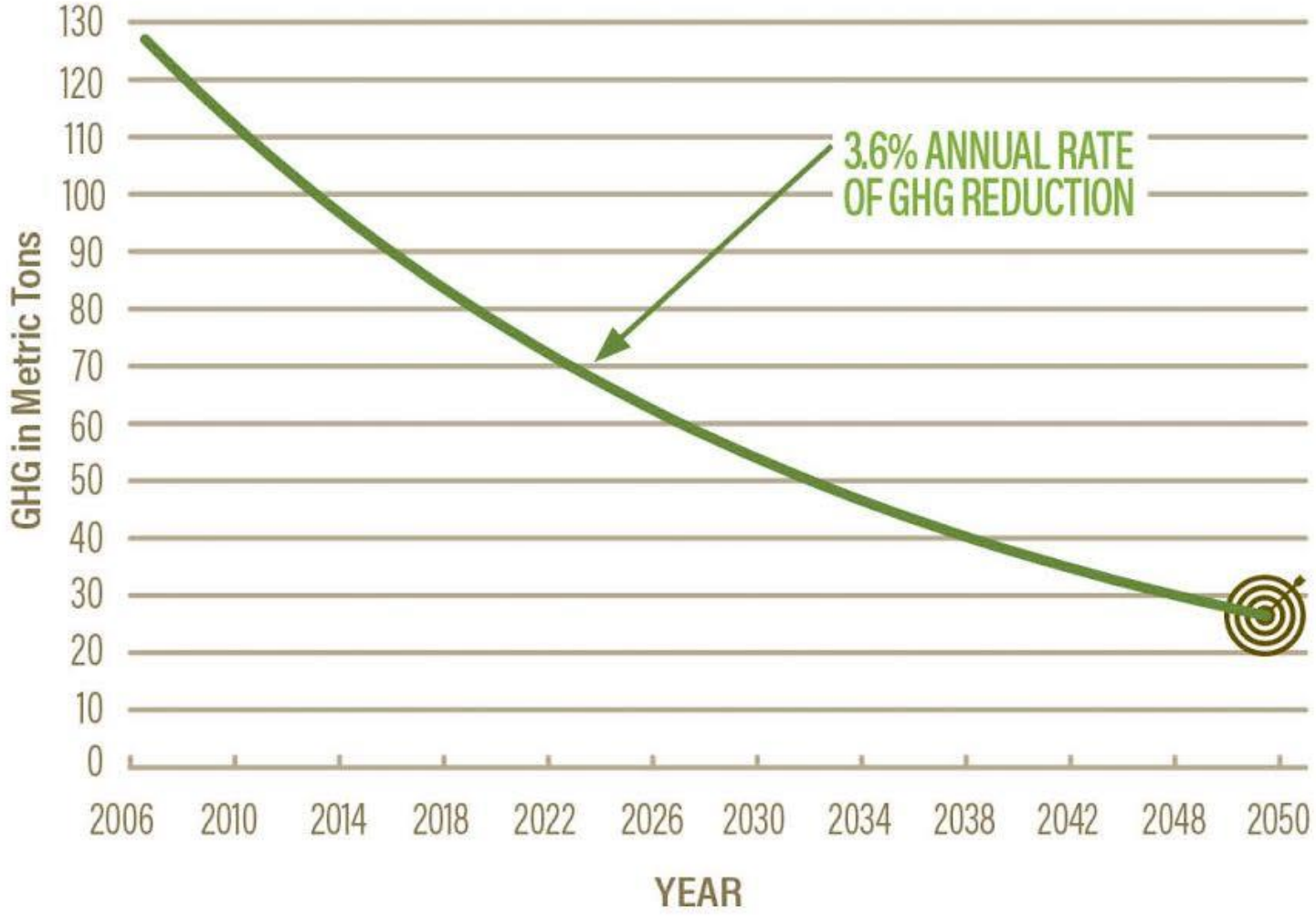
2.Increase the renewable energy fraction (decrease vulnerability of energy system)

3. Increase affordability of energy.

4. Increase resilience (decrease outages and vulnerability to disruptions).

5. Decrease risk to health from the energy system.

STATEWIDE REDUCTIONS REQUIRED BY GLOBAL WARMING RESPONSE ACT



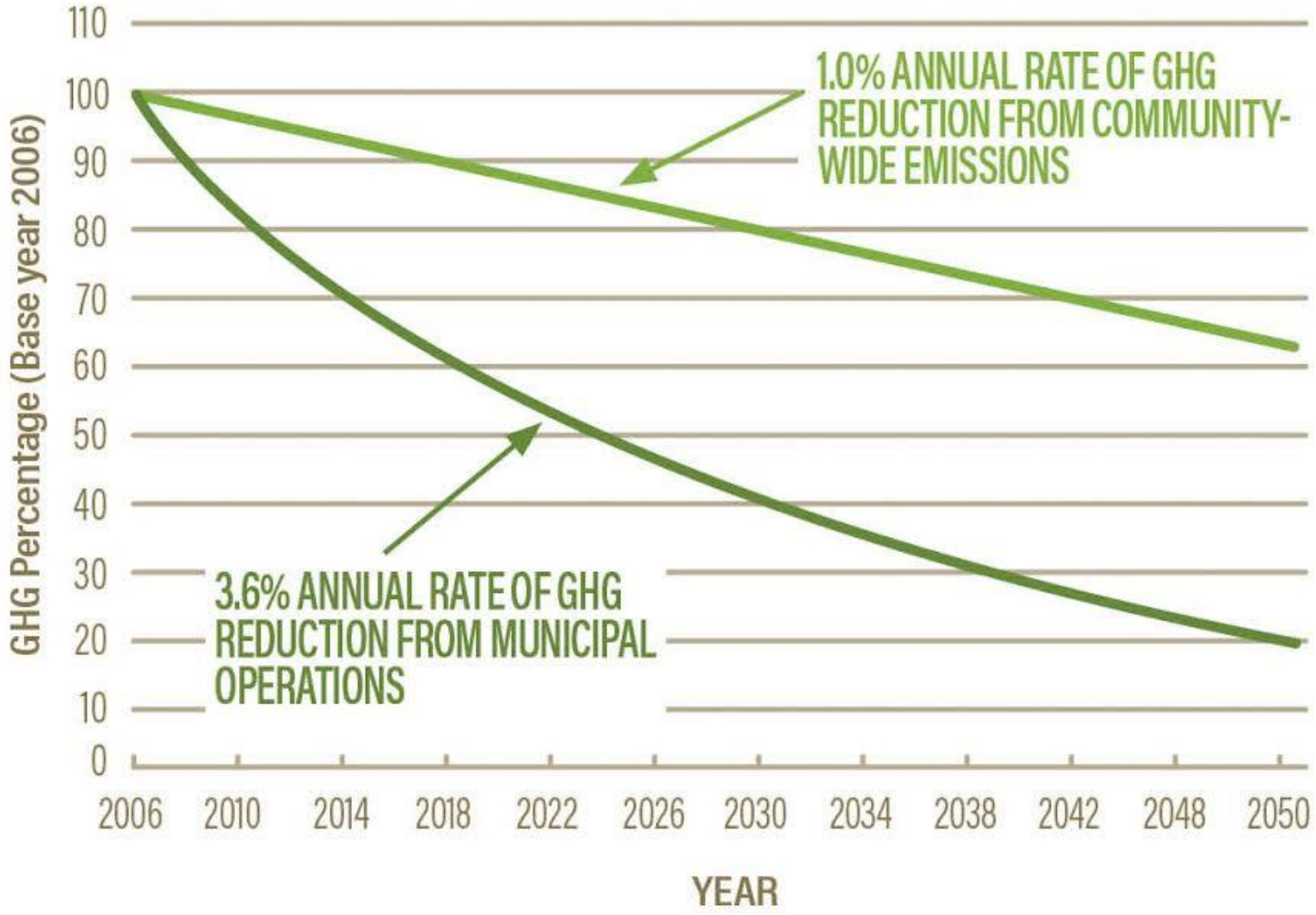
The Gold Star in Energy

Two Municipal Roles; Two Municipal Standards:

1. Municipal Operations: Buildings, Exterior Lighting, Fleets

2. Influencing the Community: Taking Effective Action to Lower Community-Wide GHG

REDUCTIONS REQUIRED FOR GOLD STAR IN ENERGY



Municipal Operations Standard

- Lower GHG emissions 3.6% per year from municipal fleet and buildings (including street and other exterior lighting).
- Municipalities must show an average annual 3.6% reduction over a three-year period (10.8% total) before becoming eligible.
- Progress will be measured from a baseline year. In order to take 'credit' for past energy conservation efforts, municipalities can select any base year going as far back as 2006.
- A 3.6% average annual reduction must be demonstrated since the base year. For example, if a municipality applying for the Gold Star in 2017 selects 2007 as the base year, it must show a total 36% reduction over that ten-year period.
- Every three years thereafter, municipalities must demonstrate continued reductions at the mandated rate to maintain the Gold Star.
- Sustainable Jersey will adjust the data to account for weather and changing fuel sources supplying the electricity grid in order to ensure that the GHG reductions shown were the result of municipal actions and not broader trends that are not affected by local action.

Strategies for Getting to Gold

MUNICIPAL OPERATIONS: GHG REDUCTION STRATEGIES AND GOAL

STRATEGIES AND ACTIONS TO ACHIEVE GOLD	TIME TO IMPLEMENT	IMPACT ON MUNICIPAL GHG
Renewable Energy Generation		**4-38%**
On-Site Solar System	1-2 years	1-35%
On-Site Wind System	3-5 years	<1%
Geothermal System	2-3 years	3%
Greening the Municipal Fleet		**15-18%**
Purchase Alternative Fuel or Efficient Vehicles	3-7 years	4%
Convert Vehicles to Alternative Fuel	1 year	2%
Trip Optimization Software	1 Year	3-6%
Proper Vehicle Maintenance	1 Year	6%
Driver Training	1 year	3%
Buildings and Street Lighting Efficiency		**12-19%**
Implement Energy Efficiency Measures	2-4 years	10-17%
Energy Tracking & Management	1 year	2%
Estimated Impact from Reduction Strategies		**31-75%**

MUNICIPAL OPERATIONS: GHG REDUCTION STRATEGIES AND GOAL

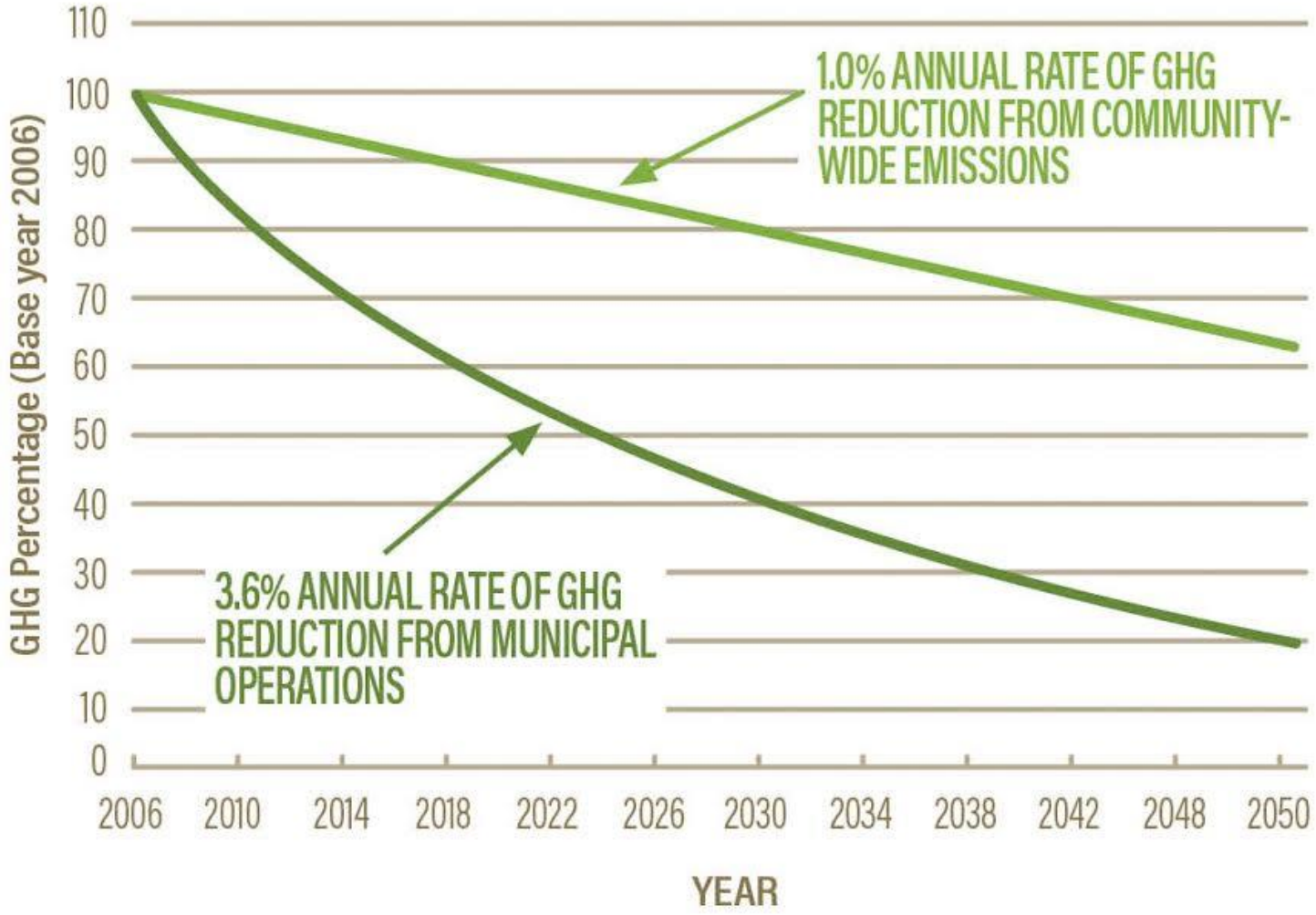
LOW-END ESTIMATED IMPACTS

- Renewable Energy Generation
- Greening the Municipal Fleet
- Buildings and Street Lighting Efficiency

HIGH-END ESTIMATED IMPACTS

- The Gap: Future Reductions From Municipal Action
- Goal Achieved: Left Over Emissions After 80% Reduction

REDUCTIONS REQUIRED FOR GOLD STAR IN ENERGY



Community-Wide GHG Standard

1. Implement actions that address four key areas:
   - Take Actions to Promote Alternative Fuel Vehicles
   - Take Actions to Promote Solar and Renewable Energy
   - Promote Building Efficiency to Residents
   - Promote Building Efficiency to Businesses
2. After five years, Sustainable Jersey will perform a review and determine if the community has met a 1% annual reduction by tracking GHG emissions over time (adjusting for weather and the changing carbon intensity of the electric grid). Adjustments may be made for local circumstances on a case-by-case basis.
3. The target rate of 1% annual reduction will be calculated on the basis of the total number of residents and the total number of people employed in a municipality.
4. Municipalities are encouraged to innovate and implement additional GHG-reducing actions they deem suited to their local conditions. Over time, the energy utility data collected and analyzed by Sustainable Jersey will provide evidence of how effective municipal efforts to influence community-wide emissions have been.

Strategies for Getting to Gold

COMMUNITY-WIDE GHG EMISSIONS: REDUCTION STRATEGIES AND GOAL

STRATEGIES AND ACTIONS TO ACHIEVE GOLD	TIME TO IMPLEMENT	IMPACT ON MUNICIPAL GHG
Renewable Energy Generation		**6-11%**
Community Purchase of Green Energy (Aggregation)	1-2 years	4-7%
Community-led Solar Initiatives	1-2 years	2-4%
Mobile Sources (vehicles)		**10-18%**
Public Alternative Fuel Vehicle (AFV) Refueling Station	1 year	5-10%
AFV Infrastructure Permitting and Zoning	1-2 years	
Development Patterns/Intensity	5-10 years	5-8%
Promoting Walking and Bicycling	2-10 years	
Building Energy Efficiency		**3-4%**
Commercial Sector Outreach (Direct Install)	1-2 years	≈1%
Outreach to Residents (Home Performance w/Energy Star)	1-2 years	≈1%
Tree Canopy (Shading Effect)	1-10 years	1-2%
Estimated Impact from Reduction Strategies		**19-33%**

COMMUNITY-WIDE GHG EMISSIONS: REDUCTION STRATEGIES AND GOAL

LOW-END ESTIMATED IMPACTS

- Renewable Energy Generation
- Mobile Sources (Vehicles)
- Buildings Energy Efficiency

HIGH-END ESTIMATED IMPACTS

- The Gap: Future Reductions Required From Municipal Actions
- Reductions by Non-Municipal Actors (Federal, State, Market)
- Goal Achieved: Left Over Emissions After 80% Reduction

Strategies for Getting to Gold

COMMUNITY-WIDE GHG EMISSIONS: REDUCTION STRATEGIES AND GOAL

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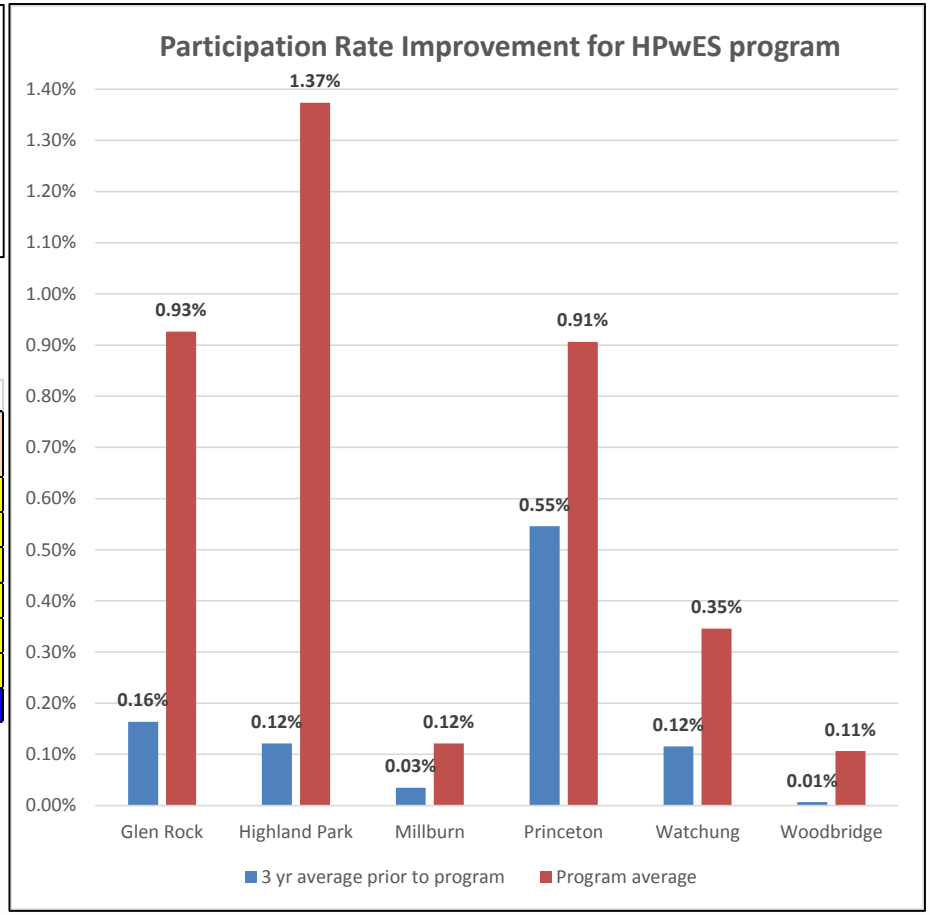
HPwES action - Results

The average participation rate improvement for the six HPwES efforts that have been certified to date in Sustainable Jersey is a “6.8-fold” increase (range low of 1.7 to a high of 15.6)

		Participation Rates					
Municipality	**Households**	**2011**	**2012**	**2013**	**2014**	**2015**	**Total Completions**
Glen Rock	3,672	0.16%	0.05%	0.27%	**0.63%**	**1.23%**	69
Highland Park	2,475	0.12%	**0.93%**	**1.82%**	0.53%	0.48%	114
Millburn	5,777	0.12%	0.02%	0.07%	0.02%	**0.12%**	24
Princeton	5,739	0.63%	0.51%	0.51%	**1.10%**	**0.71%**	301
Watchung	1,735	0.23%	0.06%	0.23%	0.06%	**0.35%**	19
Woodbridge	24,406	0.00%	0.00%	**0.02%**	**0.19%**	1.72%	509
Statewide	**2,102,465**	**0.13%**	**0.18%**	**0.23%**	**0.26%**	**0.30%**	**30,060**



Direct Install action - Results

To date, 17 municipalities have completed this action with four qualifying for additional points for exceeding the 5% target rate.

Participation rates for businesses have on average tripled in the municipalities that have completed this action.

The businesses who have participated as a result have saved an average of 27% on their energy usage as a result of upgrades from the Direct Install program.

Applicant	County
Hammonton	Atlantic
Harrington Park	Bergen
Moorestown**	Burlington
Camden**	Camden
Haddonfield	Camden
Cape May	Cape May
Montclair	Essex
Woodbury	Gloucester
Princeton	Mercer
West Windsor	Mercer
Highland Park	Middlesex
New Brunswick**	Middlesex
Woodbridge**	Middlesex
Howell	Monmouth
Madison	Morris
Berkeley Heights	Union
Springfield Township	Union

THE RULES: GOLD STAR IN ENERGY

To be awarded the Gold Star in Energy municipalities must (a) achieve GHG emissions reductions for their facilities and operations, and (b) take actions that will lower GHG emissions in the broader community.

MUNICIPAL OPERATIONS STANDARD

- **Lower GHG emissions 3.6% per year** from municipal fleet and buildings (including street and other exterior lighting).
- Municipalities must show an average annual 3.6% reduction over a three-year period (10.8% total) before becoming eligible.
- Progress will be measured from a baseline year. In order to take 'credit' for past energy conservation efforts, municipalities can select any base year going as far back as 2006.
- A 3.6% average annual reduction must be demonstrated since the base year. For example, if a municipality applying for the Gold Star in 2017 selects 2007 as the base year, it must show a total 36% reduction over that ten-year period.
- Every three years thereafter, municipalities must demonstrate continued reductions at the mandated rate to maintain the Gold Star.
- Sustainable Jersey will adjust the data to account for weather and changing fuel sources supplying the electricity grid in order to ensure that the GHG reductions shown were the result of municipal actions and not broader trends that are not affected by local action.

COMMUNITY-WIDE EMISSIONS STANDARD

- Implement four actions that our analysis shows will **lower GHG emissions at least 1% per year** in the community as a whole. The specific actions will be based on existing Sustainable Jersey actions that will be updated prior to January 2017. The actions address four key areas:

  1. Take Actions to Promote Alternative Fuel Vehicles
  2. Take Actions to Promote Solar and Renewable Energy
  3. Promote Building Efficiency to Residents
  4. Promote Building Efficiency to Businesses

The Gold Star will be awarded once all four of these actions are successfully completed.

- After five years, Sustainable Jersey will perform a review and determine if the community has met a 1% annual reduction by tracking GHG emissions over time (adjusting for weather and the changing carbon intensity of the electric grid). Adjustments may be made for local circumstances on a case-by-case basis.
- The target rate of 1% annual reduction will be calculated on the basis of the total number of residents and the total number of people employed in a municipality.
- Municipalities are encouraged to innovate and implement additional GHG-reducing actions they deem suited to their local conditions. Over time, the energy utility data collected and analyzed by Sustainable Jersey will provide evidence of how effective municipal efforts to influence community-wide emissions have been.

Sustainable Jersey Waste Goals

1.Solid waste generation is minimized.

2.Reuse and recycling of waste generated are maximized.

3.The production of hazardous waste is minimized, and that which is produced is disposed of in ways that are safe for both humans and the environment.

4.There is an equitable distribution of the impacts on human health of all forms of toxic pollution and waste disposal.

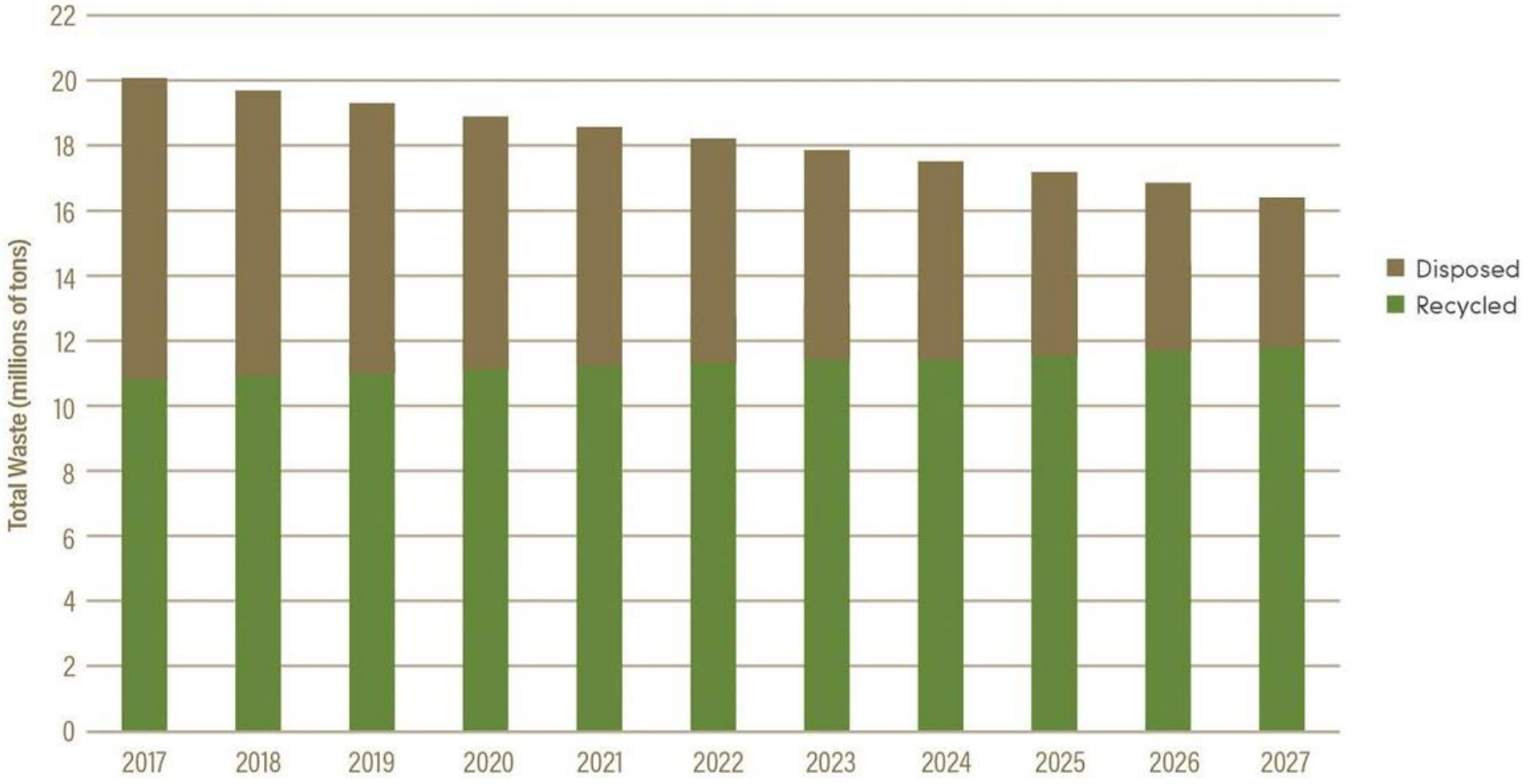
The Gold Star in Waste

1. Recycling Standard:
   - Total Solid Waste Recycling Rate: 65%
   - Municipal Solid Waste Recycling Rate: 55%

2. Waste Reduction Standard
   - 2% Annual Reduction in Total Solid Waste Generation

IMPACT OF GOLD STANDARD ON NJ WASTE GENERATION & RECYCLING

This chart shows the impact on the statewide waste stream if every municipality achieved the Gold Star.



The Gold Star in Waste cont.

3. Education and Enforcement Standard
   - Source reduction to lower the generation of waste,
   - Improve quality of recycling stream (absence of non-recyclable materials), and,
   - Promote alternatives to and safe disposal of household hazardous waste.

4. Hazardous Waste Standard
   - Implement prescriptive actions dealing with collection of common hazardous materials,
   - Municipal collections may include such hazardous materials as: used motor oil, consumer electronics, paint, and/or batteries,
   - A strong effort on prescription drug safety and disposal will be among the mandated actions.

Strategies for Getting to Gold

IMPACTS FROM WASTE REDUCTION STRATEGIES

WASTE REDUCTION STRATEGIES	IMPACT ON ANNUAL WASTE REDUCTION
Pay-As-You-Throw Program	14-27%
Cut It and Leave It Program (Grass)	3 - 5%
Waste Reduction Eduction & Enforcement	1-10%
Backyard Composting	1-5%
Materials Reuse Program	1-5%
Reusable Bag Education Program	0.60%

IMPACTS FROM RECYCLING STRATEGIES

RECYCLING STRATEGIES	ESTIMATED ANNUAL INCREASE IN RECYCLING RATE
Pay-As-You-Throw Program	30-60%
Food Waste	8%- 25%
Recycling Education & Enforcement	1-20%
Non-Mandated Materials Recycling	5-15%
Construction and demolition	4-11%
Commercial & Institutional Recycling	4-10%

THE RULES: GOLD STAR IN WASTE

1) DOCUMENTED RECYCLING RATE

To attain the Gold Star in Waste, a municipality must document an annual recycling rate that averages over a three-year (renewable) period at least:

- **65%** of **Total Solid Waste** (exclusive of leaves) **or**
- **55%** of **Municipal Solid Waste** (exclusive of leaves).

2) WASTE GENERATION REDUCTION

- The amount of total solid waste generated must decrease at the rate of **2%** or more per year, averaged over three years (6%).
- This rate shall be calculated on the basis of the total number of residents and the total number of people employed in a municipality.
- Every three years, a further reduction of 6% Total Solid Waste must be demonstrated in order to renew Gold Star status.

3) HOUSEHOLD HAZARDOUS WASTE REDUCTION AND SAFE DISPOSAL ACTIONS

- Municipalities will be required to implement prescriptive actions dealing with collection of common hazardous materials. These actions will be released as more rigorous and/or comprehensive versions of existing Sustainable Jersey actions in January 2017.
- Municipal collections may include such hazardous materials as: used motor oil, consumer electronics, paint, and/or batteries.
- A strong effort on prescription drug safety and disposal will be among the mandated actions.

4) COMMUNITY EDUCATION AND ENFORCEMENT

Municipalities will be required to implement a robust education and/or enforcement campaign on recycling and waste reduction. The campaign must address:

- source reduction to lower the generation of waste,
- the quality of recycling stream (absence of non-recyclable materials), and
- alternatives to and safe disposal of household hazardous waste.

New Resources: Getting to Gold

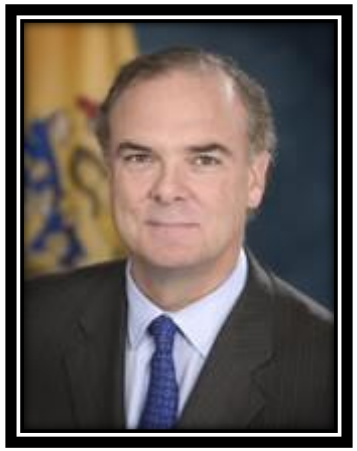
- Municipalities can't achieve Gold alone
- Sustainable Jersey has resources to help
- Sustainable Jersey, alone, does not have enough resources
- Achieving Gold will be a collective effort among resources organizations, public and private; state, county, federal.

SUSTAINABLE JERSEY SOLAR CHALLENGE

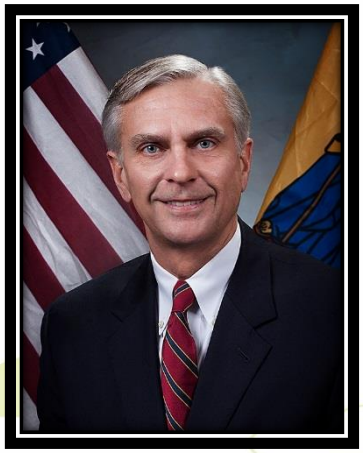
- Benefits of participating in the Solar Challenge:
  - Make Your Town Solar Friendly Action points
  - Simple, cost-effective method to promote solar
  - Lowers cost and complexity for consumers
- Participating communities can:
  - Reduce their community carbon footprint
  - Become recognized leaders in local solar installations
  - Help residents save on utility bills
  - Get Sustainable Jersey points
  - Make progress toward achieving GOLD!

@SJ_Program
#SustainableStateNJ

Electric Vehicle Charging Grant Program



Bob Martin
Commissioner, New Jersey Department of Environmental Protection



Richard Mroz
President, New Jersey Board of Public Utilities

2016 NEW JERSEY SUSTAINABILITY SUMMIT

The Rest of the Day

- 15 Minute Break
- Breakout Sessions 11:30AM – 12:30PM
- Lunch: Served in Lobby with Seating in Various Locations Outside
- Breakout Sessions 1:30PM – 2:45PM
- Breakout Sessions 3:00PM – 4:15PM
- Evaluations to be Emailed to All Participants. Your Feedback is Appreciated!